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FOREST INDUSTRY CAPACITY, PRODUCTION and AVAILABLE LOG SUPPLIES

in the Douglas-Fir Subregion

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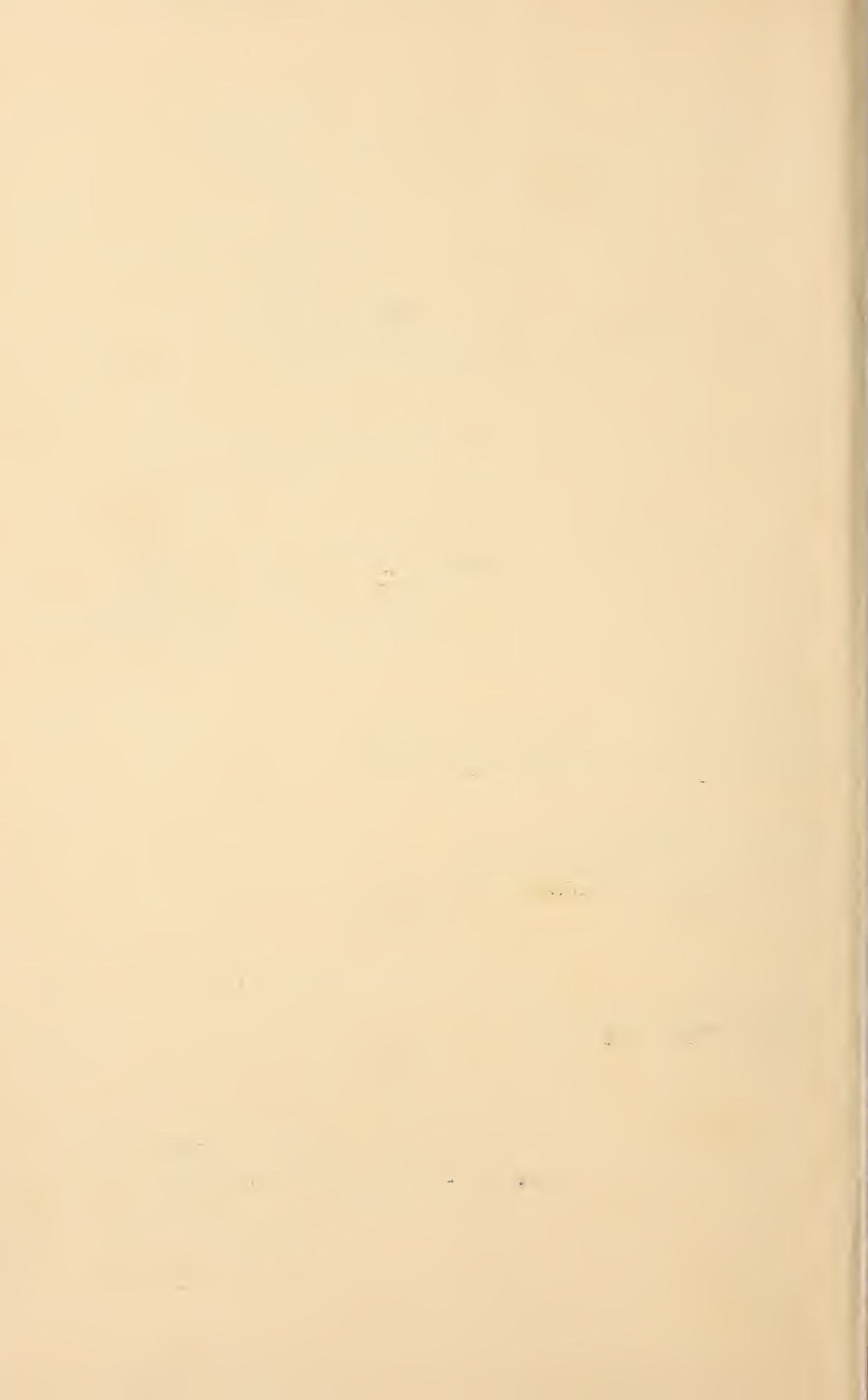
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by JOHN FEDKIW

PACIFIC NORTHWEST
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U.S. DEPARTMENT OF AGRICULTURE

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U. S. DEPARTMENT OF AGRICULTURE



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FOREWORD

Until the time of World War II, the forest industries of the Douglas-fir subregion in the States of Oregon and Washington enjoyed a relative abundance of log supplies. Since World War II, however, log supply has generated critical problems for many wood-using plants in the subregion. Average stumpage prices for Douglas-fir timber, for example, increased from less than \$10 per thousand board feet in 1947 to more than \$30 per thousand board feet in 1959 and 1960. Lumber realization in the Douglas-fir subregion, on the other hand, after increasing to \$80.50 in 1951, declined to \$75.01 in 1960. One response to this situation was an increase in pressure to raise the allowable cut on public lands and to intensify timber management in order to sustain existing installed capacity.

This study was undertaken to develop a better understanding of the changing forest industry complex in the Douglas-fir subregion in relation to the log supply situation. It studies trends and relationships in forest industry capacity, production, and available log supplies and examines the outlook and prospective problems of log supply and plant adjustments in the subregion.

Information on capacity and production is presented separately for the lumber, plywood, and pulp industries. Total capacity of these forest industries is then compared with total log production and with the prospectively available log supplies indicated by the allowable cut plans of public forestry agencies and by projections of available log supplies from private timberlands.

Trends and relationships are shown for the subregion as a whole and separately for four subareas as follows:

WASHINGTON

Puget Sound (composed of Clallam, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom Counties)

Southwestern Washington (composed of Clark, Cowlitz, Grays Harbor, Pacific, Skamania, and Wahkiakum Counties)

OREGON

Northwestern Oregon (composed of Benton, Clackamas, Clatsop, Columbia, Hood River, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill Counties)

Southwestern Oregon (composed of Coos, Curry, Douglas, Jackson, Josephine, and Lane Counties)

Since this study was completed, the author, Dr. John Fedkiw, was transferred to the Washington, D. C., office of the Forest Service.

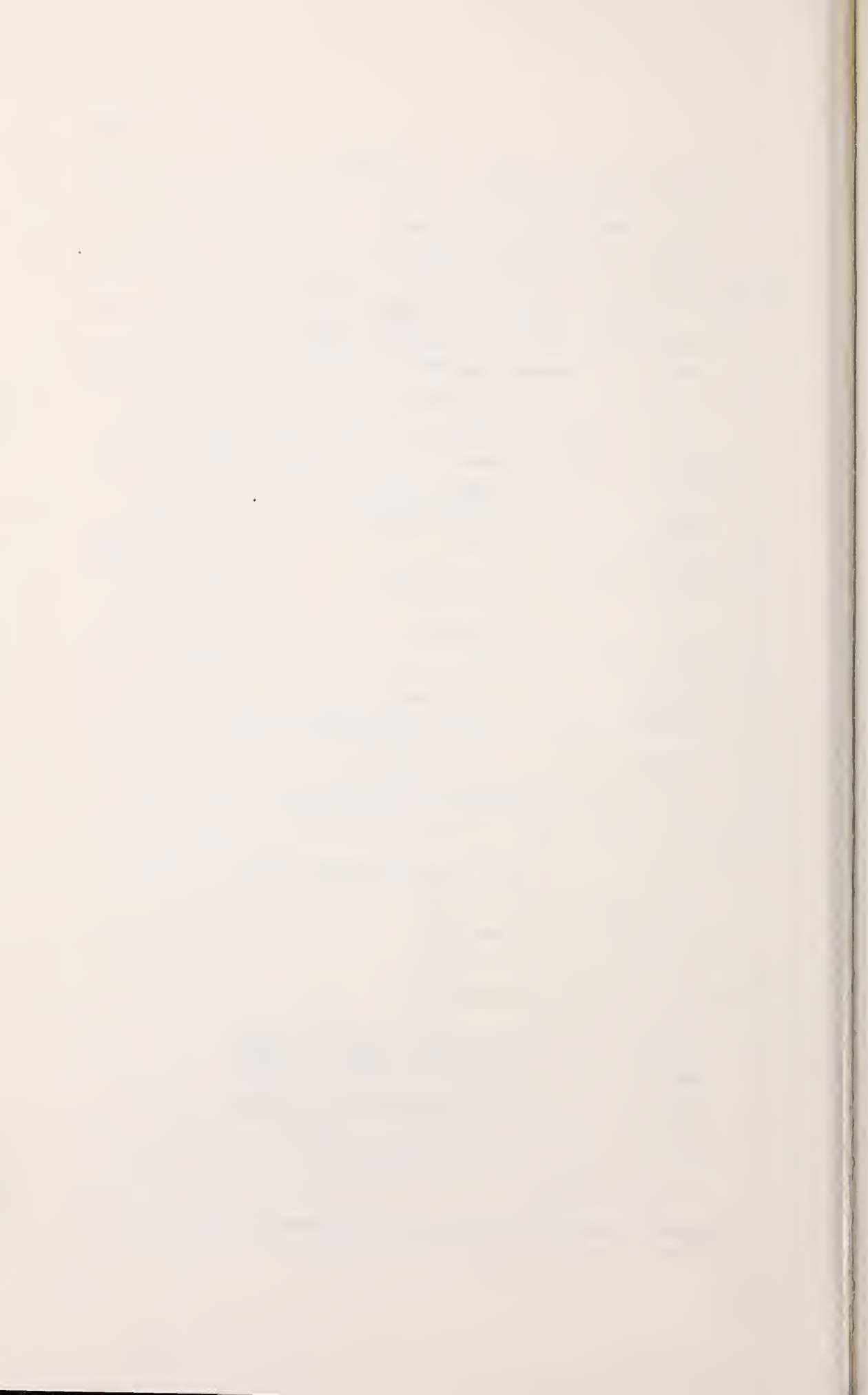
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The Lumber Industry

Before World War II, 80 percent or more of the log production of the subregion was consumed by the lumber industry. After 1955, however, lumber was only able to command 65 percent of the log output. Unused sawmill capacity became a prevalent issue for much of the lumber industry in the decade of the 1950's.

Definition and Estimation of Plant Capacity

Annual plant capacity in this report is defined as the maximum practicable lumber output that might be obtained from installed plant and equipment, assuming availability of timber, labor, and other production factors and the typical shifts operated by the industry in periods of favorable market demand.

Available information on plant capacity in the lumber industry of the Douglas-fir subregion is not exact, complete, or precisely comparable from year to year. Accordingly, the estimates compiled for this report must be considered as subject to some interpretation.

Estimates of annual capacity are presented in the last column of table 1. They were derived by applying the following expansion factors to the total reported daily capacity of sawmills as tabulated in the second column of table 1:

1929-34	300 ¹
1935-39	250 ¹
1940-60	240

¹ Factors used in this report for the period 1929 to 1939 are derived from the footnotes, p. 31, of "The Douglas Fir Lumber Industry," Bur. Res. Statis., Advisory Comm., Council Natl. Defense. 98 pp. 1941.

The factor 240 is the average ratio of reported annual production to reported daily capacity during the 3 years 1942 to 1944 when utilization of daily sawmill capacity was at the highest consistent level for the period 1940-60. The expansion factor 240 is an average for the industry. Factors for individual mill size classes have been estimated to be as follows:

Mill size class, daily capacity (Board feet)	Average days operated per year (Number)
0- 39,999	160
40,000- 79,999	220
80,000-119,999	250
120,000+	280

These were derived by relating reported daily capacity to the annual production of each size class during the years 1948 to 1958. Within each mill size class there is considerable variation in days operated by individual mills.

Table 1. — Estimated sawmill capacity in the Douglas-fir subregion, 1929-60

Year	Active and idle mill capacity	
	Daily	Annual
	Thousand board feet	Million board feet
1929	39,740	11,922
1930	38,768	11,630
1931	--	--
1932	33,066	9,920
1933	32,267	9,680
1934	33,404	8,351
1935	--	--
1936	34,409	8,602
1937	36,432	9,108
1938	35,279	8,820
1939	--	--
1940	35,809	8,952
1941	37,939	9,105
1942	37,688	9,045
1943	37,427	8,982
1944	34,560	8,294
1945	--	--
1946	37,783	9,068
1947	43,202	10,368
1948	44,936	10,785
1949	45,165	10,840
1950	45,922	11,021
1951	50,161	12,039
1952	49,583	11,900
1953	47,098	11,304
1954	46,364	11,127
1955	47,858	11,486
1956	44,530	10,687
1957	42,785	10,268
1958	40,527	9,726
1959	39,724	9,534
1960	39,431	9,464

Source: Daily capacity from directories of the forest industries, published by The Lumberman and The Timberman, Portland, Oreg.

The figures for daily capacity for the period 1929-60 were derived by summing the daily capacity of sawmills listed in the directories of the forest industries published annually by The Lumberman and The Timberman. These listings were corrected for obvious inconsistencies between years and for omissions in the case of a few larger mills whose capacities were otherwise known.

The daily capacity listed in the directories is for one or more shifts as reported by each mill. The listings included idle mills without differentiation from active mills and also mills for which no capacity was reported. The latter, for the most part, were the very smallest mills and no capacity was estimated for them in table 1. Mills reported out of business were excluded.

Relationships in the Subregion

Sawmill Capacity and Lumber Production Show Wide Fluctuations

Figure 1 and table 2 show annual sawmill capacity and annual lumber production between 1925 and 1960. Changes in reported capacity generally have followed the broad movements in the lumber market. When lumber production was at its peak levels of 10.3 and 10.4 billion board feet respectively in 1929 and 1952, capacity likewise was at a peak level, 11.9 billion board feet in both 1929 and 1952. Between the peak production years, capacity fell to a low level of about 8.8 billion feet from 1934 to 1944. Production, however, dropped more, reaching a low of 3.2 billion feet in 1932 and averaging 5.8 billion feet between 1930 and 1940.

Table 2. — Annual capacity and production of the lumber industry in the Douglas-fir subregion, 1925-60

Year	Lumber production	Capacity	Unused Capacity	
			Amount	Percent of capacity
	MM bd. ft.	MM bd. ft.	MM bd. ft.	
1925	9,514	--	--	--
1926	10,285	--	--	--
1927	9,902	--	--	--
1928	10,109	--	--	--
1929	10,290	11,922	1,632	14
1930	7,681	11,630	3,949	34
1931	5,401	--	--	--
1932	3,153	9,920	6,767	68
1933	4,348	9,680	5,332	55
1934	4,396	8,351	3,955	47
1935	5,113	--	--	--
1936	6,838	8,602	1,764	21
1937	7,067	9,108	2,041	22
1938	5,510	8,820	3,310	38
1939	6,945	--	--	--
1940	7,589	8,952	1,363	15
1941	--	9,105	--	--
1942	9,058	9,045	-13	0
1943	8,664	8,982	318	4
1944	8,496	8,294	-202	-2
1945	6,586	--	--	--
1946	7,835	9,068	1,233	14
1947	8,962	10,368	1,406	14
1948	9,405	10,785	1,380	13
1949	9,135	10,840	1,705	16
1950	10,108	11,021	913	8
1951	9,650	12,039	2,189	18
1952	10,364	11,900	1,536	13
1953	9,745	11,304	1,559	14
1954	9,283	11,127	1,844	17
1955	9,662	11,486	1,824	16
1956	8,759	10,687	1,928	18
1957	7,952	10,268	2,316	23
1958	8,439	9,726	1,287	13
1959	9,104	9,534	430	5
1960	8,029	9,464	1,435	15

Source: Lumber production data from West Coast Lumbermen's Association.

CAPACITY and PRODUCTION--LUMBER

BILLION BOARD FEET, LUMBER TALLY

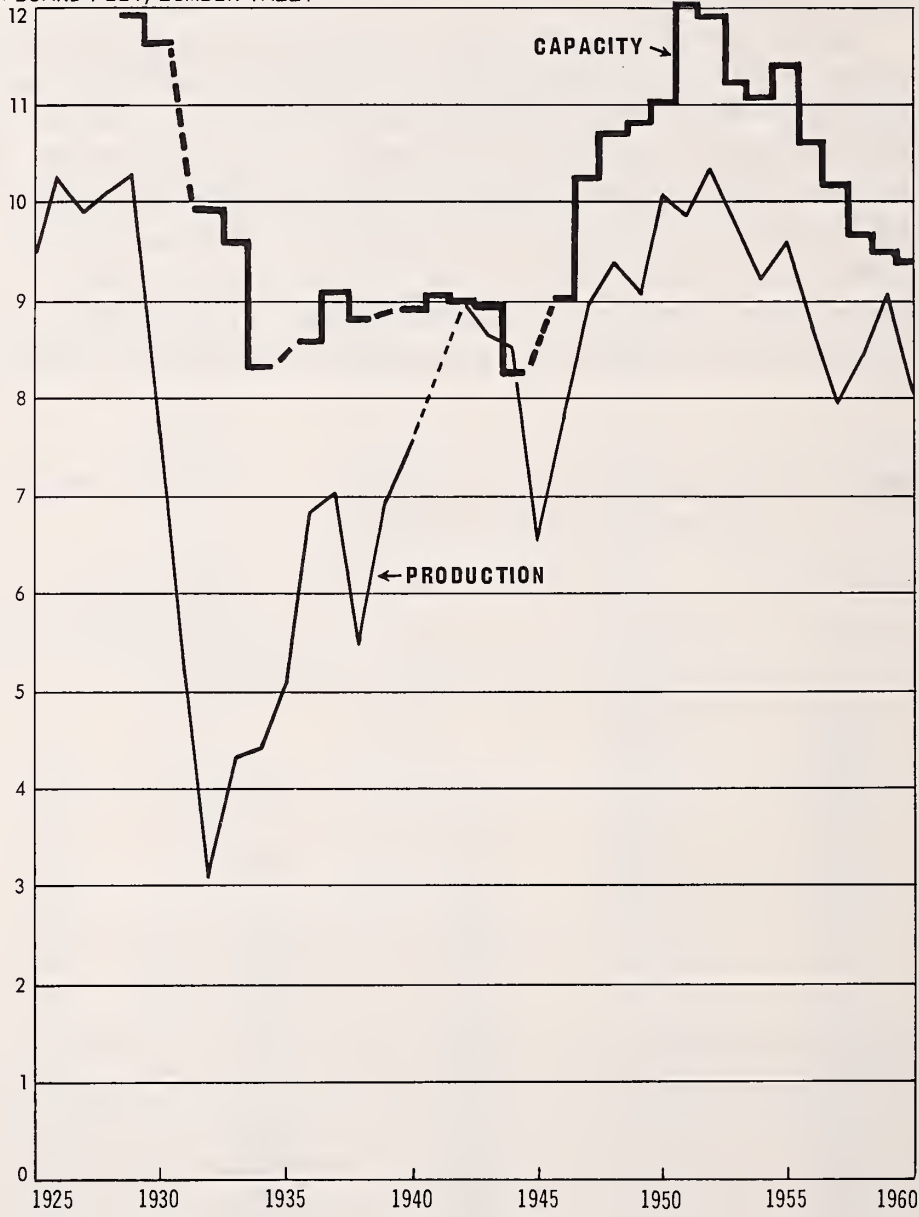


Figure 1. — Annual capacity and production of the lumber industry in the Douglas-fir subregion, 1925-60.

After the postwar peak in lumber production in 1952, the lumber industry of the Douglas-fir subregion adjusted its capacity downward by 2,576 million board feet.¹ Lumber capacity in 1960 was 9,463 million feet. In the same period, production declined from the high level of 10,017 million board feet in the years 1950-53 to an average level of 8,381 million feet in the years 1957-60.

Unused Capacity a Persistent Characteristic

During the great depression of the 1930's, the lumber industry's capacity was reduced but not nearly as much as its production. For some years after 1929, there was considerable unused capacity relative to the market. Unused capacity averaged more than 40 percent through 1934. Then, and until 1940 when it dropped to 15 percent, it varied between 21 and 38 percent.

During World War II, lumber capacity in the subregion was rather fully utilized. In the following years, when the national lumber market expanded to meet the demands of the postwar building boom, capacity increased more than production. From 1952 to 1960, the industry carried an average unused capacity of 15 percent or 1.6 billion board feet. In 1959, unused capacity was at the lowest level since the end of the war, partly because of the high level of production in that year and partly because of the reduction in capacity that had taken place in the preceding years. In 1960, however, when the lumber market was down, unused capacity was again up to a high level of 1.4 billion board feet.

Capacity Changes Related to Prices and Earning Rates

The rapid postwar expansion of lumber capacity in the Douglas-fir subregion was directly associated with the rise in lumber prices and earning rates. From 1938 to 1946, average lumber realization value increased from \$19.14 to \$45.48 per thousand board feet — 11.4 percent per year.² From 1946 to 1951, lumber realization value increased 12.1 percent per year to \$80.50.

Up to 1947, the sharp rise in lumber price was accompanied by a rapid increase in the apparent earning rate in the Douglas-fir lumber industry.³ It increased from 7.8 percent in 1938 to a high of 32.7 percent

¹ The gross reduction exceeded 3 billion board feet. This was offset in part by new construction as the center of lumber production shifted southward to southwestern Oregon and by continued expansion of capacity of mills with an output of 80,000 to 119,999 board feet per day while capacity in other mill size classes declined.

² From West Coast Lumbermen's Association, "Industrial Facts," published monthly, Portland, Oreg.

³ Based on average lumber realization and average cost as reported by the West Coast Lumbermen's Association. These data do not provide a precise measure of profits of the lumber industry in the Douglas-fir subregion. It is assumed, however, that the difference between average realization and average cost is correlated with net earnings. The difference expressed as a percent of average realization is herein referred to as the apparent earning rate.

in 1947. From 1946 to 1951, the apparent earning rate averaged 24 percent. In the same period, capacity increased 3.0 billion board feet while production increased 2.0 billion feet. After 1951, the apparent earning rate, capacity, and production all declined while average costs continued to rise, as can be seen from figure 2.

Competitive Strength of Lumber Declines During Expansion of Capacity

During the postwar expansion of lumber capacity, average lumber realization values and prices in the Douglas-fir subregion rose more than the wholesale prices of other building materials. From 1938 to 1951, the wholesale price index of construction materials increased only 7.4 percent⁴ per year, compared with an 11.7 percent per year increase in average realization for the subregion's lumber output. The tremendous inflation of lumber prices to 1951 tended to reduce the competitive strength of lumber in the building materials market. The relative price behavior of lumber from the subregion and selected competing materials is illustrated in figure 3.

After 1951, the wholesale price index for all commodities rose some 0.5 percent per year, while the wholesale price index for construction materials rose about 1.1 percent per year. Average lumber realization values for the Douglas-fir subregion, on the other hand, declined an average of 0.7 percent per year.

These trends tended to restore somewhat the competitive strength of lumber from the Douglas-fir subregion relative to other construction materials, but not enough to halt the downward trend in production at the same time.

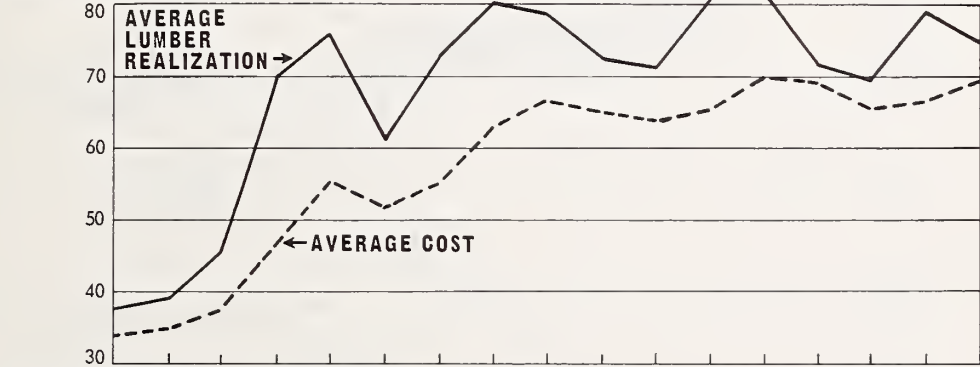
Western Lumber Production Expands as Douglas-fir Subregion's Declines

From 1946 to 1960, lumber production in the Western States expanded 34 percent as shown in figure 4. Lumber production in the Douglas-fir subregion, however, rose from about 8 billion board feet in 1946 to 10.4 billion board feet in 1952, and then dropped back to about 8 billion feet in 1960. The steady rate of growth in lumber production in the balance of the Western States not only was sufficient to offset the substantial decline in the Douglas-fir subregion since 1952, but was also great enough to expand the total output of the Western States to a new high level of 22 billion feet in 1959.

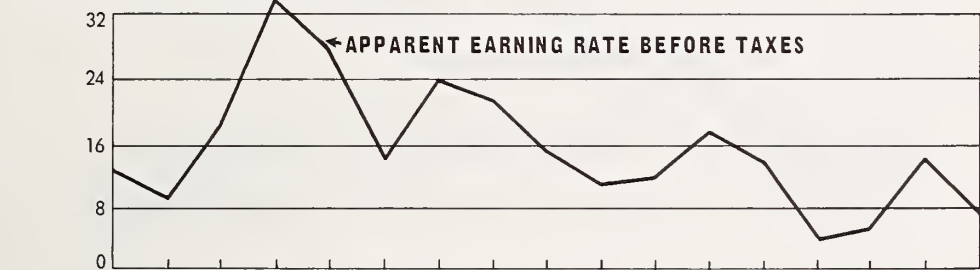
⁴ Table 8, p. 41 of: U. S. Forest Service and Agricultural Stabilization and Conservation Service. The demand and price situation for forest products. 47 pp., illus. 1961.

AVERAGE LUMBER PRICES, COST, and EARNING RATE

DOLLARS PER M BD. FT.



PERCENT OF AVERAGE REALIZATION



BILLION BOARD FEET, LUMBER TALLY

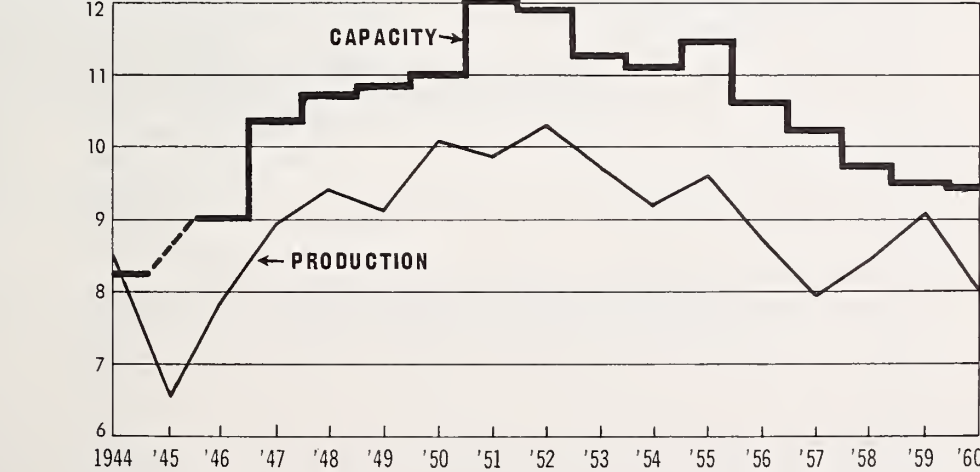


Figure 2. — Relationship of capacity and production to lumber prices and apparent earning rate before taxes.

WHOLESALE PRICE INDEX FOR LUMBER and OTHER MATERIALS

WHOLESALE PRICE INDEX (1930 = 100)

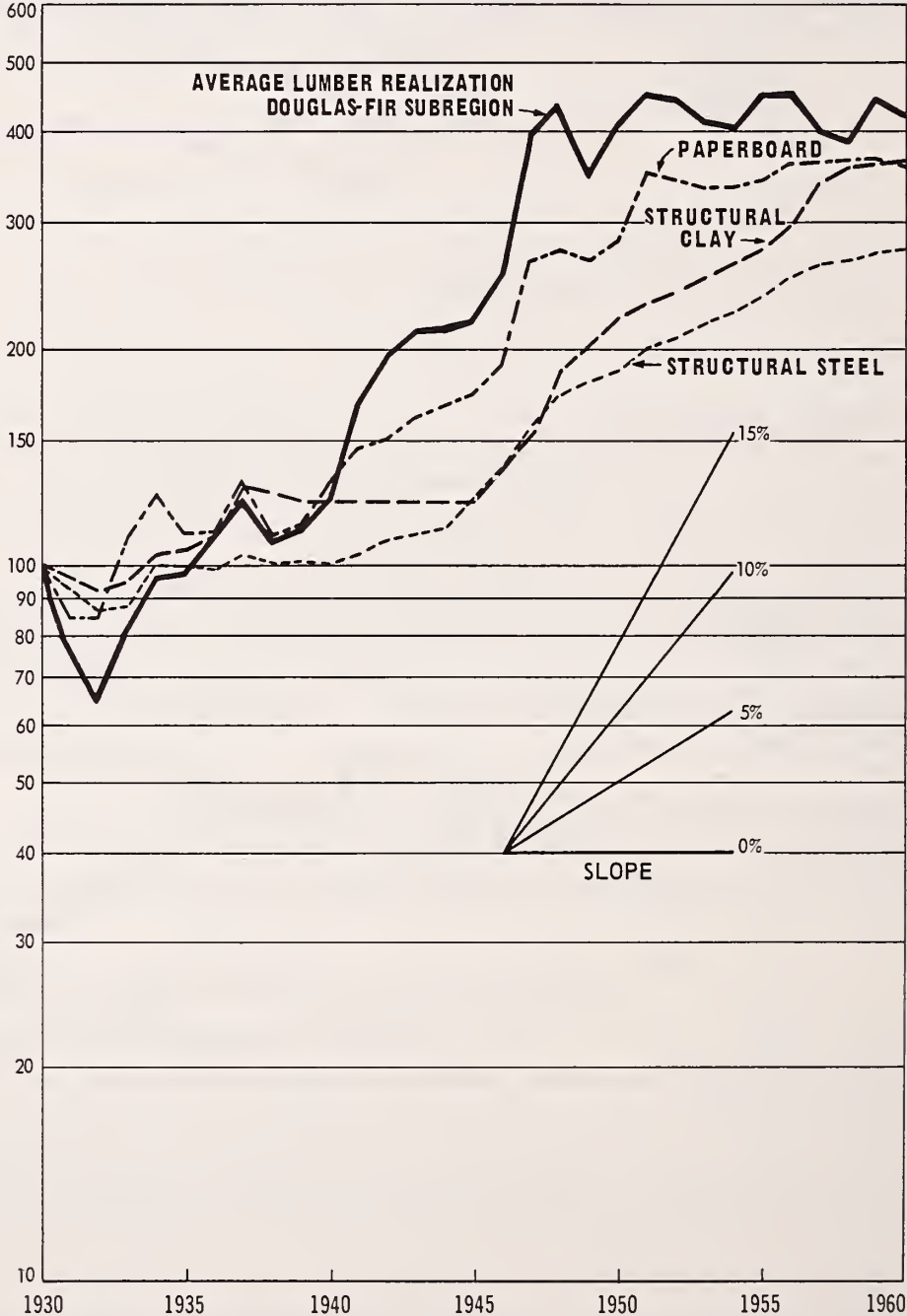


Figure 3. — Trend of wholesale price index for lumber and selected construction materials, 1930-60.

Sources: Table 8, adapted to 1930 = 100, from "The Demand and Price Situation for Forest Products." U. S. Forest Serv. and Agr. Stabilization Consrv. Serv., 47 pp., illus. 1961. Average lumber realization of Douglas-fir subregion from West Coast Lumbermen's Association "Industrial Facts," published monthly, Portland, Ore.

TRENDS in LUMBER PRODUCTION

BILLION BOARD FEET, LUMBER TALLY

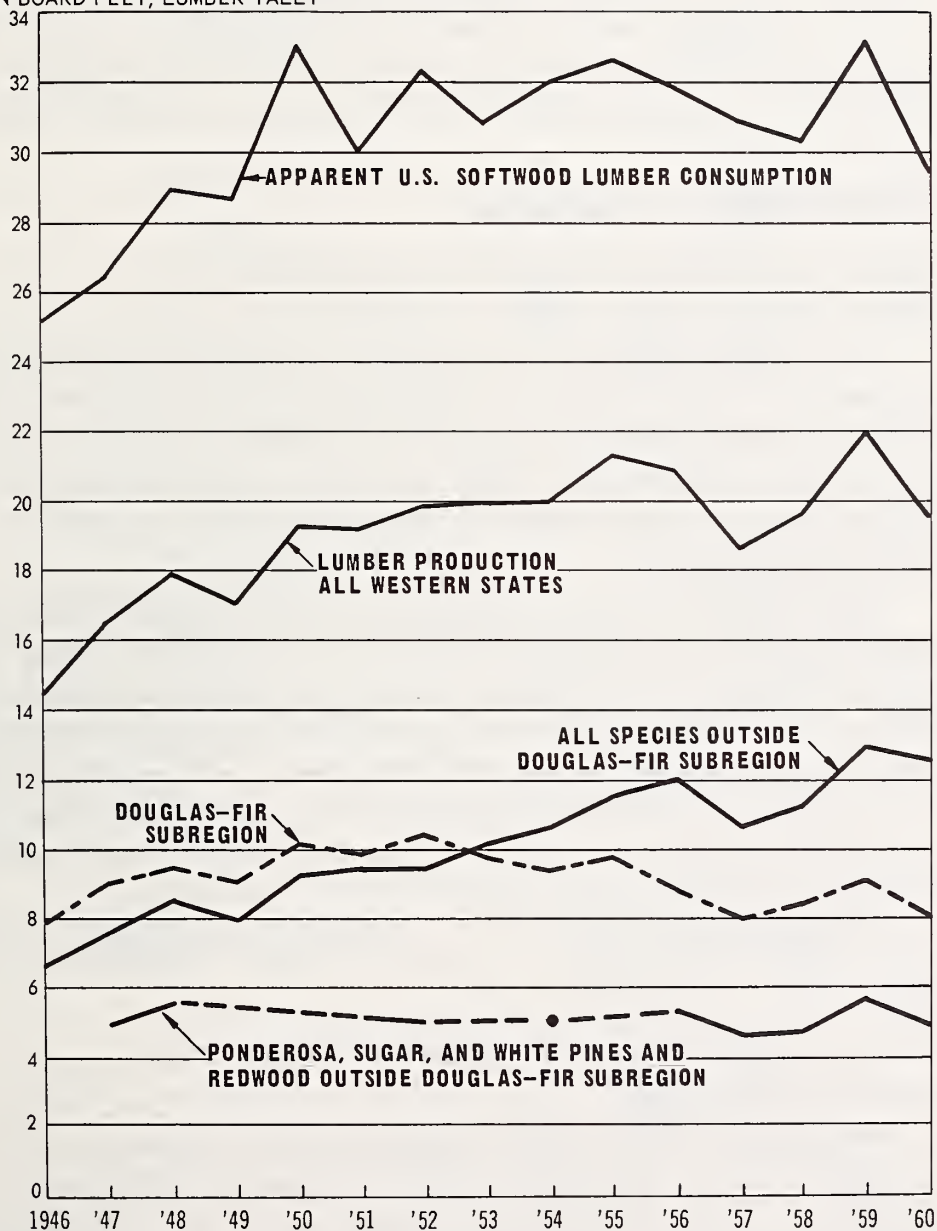


Figure 4. — Trends in western lumber production and apparent U. S. softwood lumber consumption, 1946-60.

Apparent U. S. lumber consumption remained more or less stable after 1950, averaging 31.7 billion feet to the end of the decade, with an average deviation of only 3.1 percent. Lumber production in the Western States, on the other hand, increased its share of U. S. softwood consumption from 58 percent in 1950 to 66 percent in 1960. The share of the Douglas-fir subregion, however, declined from about 31 percent in 1950 to 27 percent in 1960.

Relationships in Subareas

Western Washington's Sawmill Capacity Shows Steady Decline Since 1929

From 1929 to 1960, the annual sawmill capacity in western Washington declined 4.6 billion board feet. Production declined sharply from 1929 to 1932, recovered somewhat during the war years, then dropped again to less than 2.5 billion feet in 1960. As can be seen from figure 5, the heaviest losses in capacity and production in this period occurred in the Puget Sound area.

After 1952, both lumber capacity and lumber output declined, with capacity steadily adjusting more closely to actual production. From 1955 to 1960, however, the unused capacity still averaged about 13 percent of total capacity. Most of the excess was concentrated in the Puget Sound area, where it averaged about 333 million feet or 18 percent per year. In southwestern Washington, on the other hand, capacity and output have been closely adjusted since 1940. There the average unused capacity from 1955 to 1960 was only 30 million feet, or 3 percent.

In 1960, however, unused capacity in western Washington was 500 million feet, or 17 percent.

Western Oregon's Sawmill Capacity Shows Large Increase Since 1929

After 1929, western Oregon's sawmill capacity declined to a low of 3.5 billion feet in 1932 and then slowly recovered during the balance of the 1930's. In 1942, its capacity exceeded western Washington's for the first time, and as the lumber industry continued to shift from Washington to Oregon, western Oregon's capacity rose to a peak of 8.4 billion feet in 1951. In the next 3 years, Oregon's capacity declined to 7.9 billion feet, as can be seen from figure 5, but in 1955 it was again up to 8.4 billion as expansions in southwestern Oregon temporarily offset declines in northwestern Oregon. After 1955, however, western Oregon's capacity dropped abruptly, reaching a low of 6.6 billion feet in 1960.

LUMBER CAPACITY and PRODUCTION by SUBAREAS

BILLION BOARD FEET, LUMBER TALLY

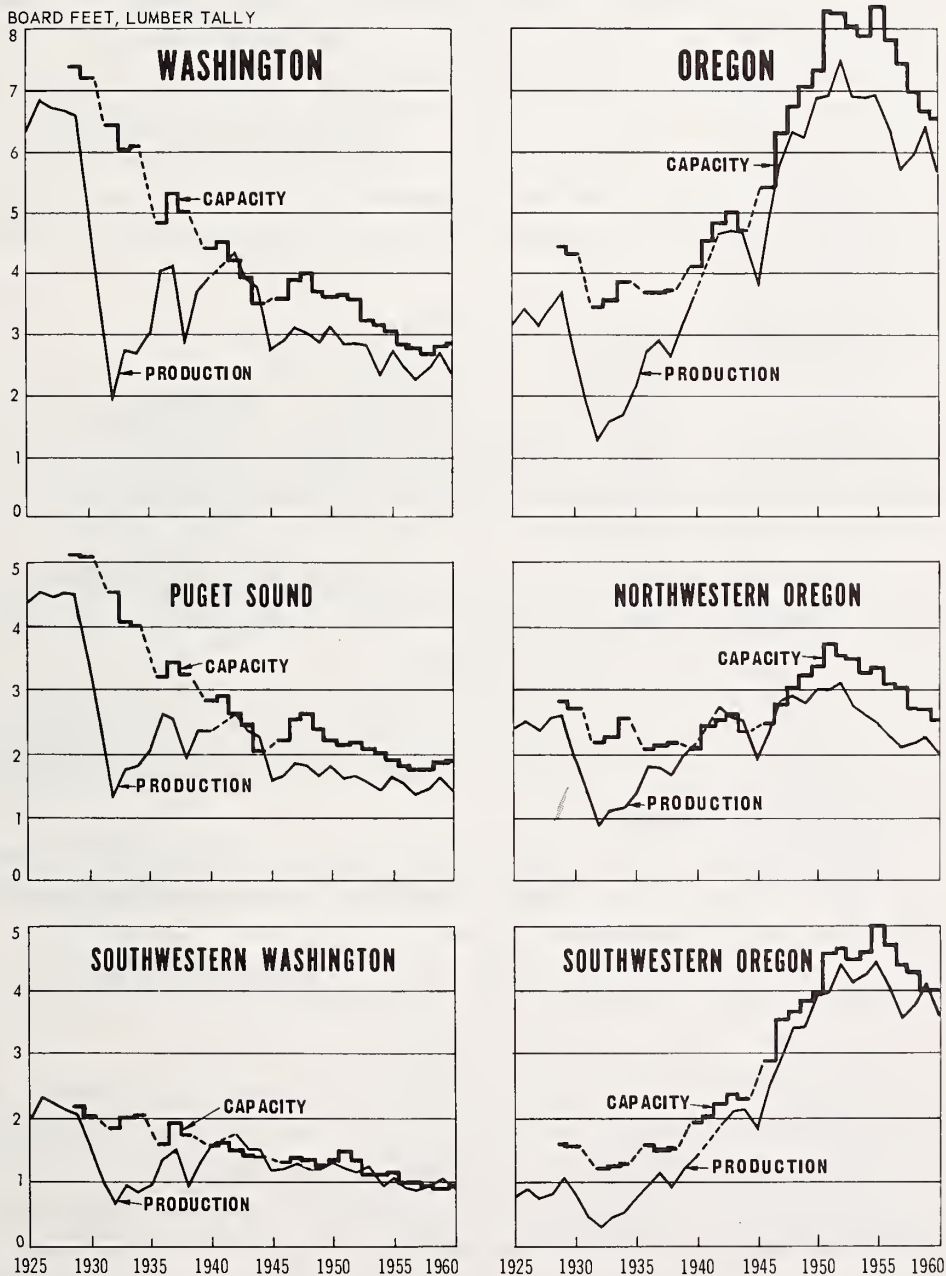


Figure 5. — Annual lumber production and capacity in the Douglas-fir sub-region by State and subarea, 1925-60.

Lumber production in western Oregon followed the general pattern of the changes in capacity, but dropped to much lower levels during the 1930's and fell more than a billion feet short of the peak levels of capacity in 1951 and 1955. During the period of most rapid expansion, 1946 to 1950, unused capacity in Oregon averaged only 8 percent, or 554 million board feet. In the following 5 years, when western Oregon's production was at its peak level, unused capacity averaged 1.148 billion board feet, or 14 percent. And in 1960, when capacity had been reduced 1.8 billion feet, unused capacity was still at a high level, 935 million feet, and still 14 percent.

Unused Sawmill Capacity Has Been Highest In Northwestern Oregon

Expansion of capacity in northwestern Oregon culminated in 1951 at 3.8 billion board feet. Thereafter, it declined 1.2 billion feet to 2.6 billion in 1960 — a substantial reduction of capacity but not as much as the drop in lumber output.

In the 3 years 1950-52, when production was at its historical peak, unused capacity averaged 524 million feet, or 15 percent. In 1959, it was 17 percent and in 1960, 21 percent.

In southwestern Oregon, sawmill capacity continued to expand until 1955 when it reached 5.0 billion board feet. Production culminated in that same year at 4.4 billion feet, with an unused capacity of 570 million feet, or about 10 percent.

After 1955, however, capacity declined even more rapidly than in northwestern Oregon. In 1960, nevertheless, unused capacity was still 10 percent, or 404 million board feet.

Relationships Among Mill Size Classes

Largest Mills Show Greatest Decline in Capacity

From 1929 to 1960, the largest mill size class in the Douglas-fir subregion, mills with 120,000 board feet or more per day capacity, declined 8.7 million board feet in daily capacity. As can be seen from figure 6, the daily capacity in this size class in western Washington declined from 18.0 million feet to 5.7 million feet, while in Oregon it increased from 7.9 million feet to 11.5 million feet, offsetting only 30 percent of the decline in western Washington.

All other mill size classes in the Douglas-fir subregion increased total daily capacity between 1929 and 1960. However, the total capacity of the smaller mill size classes, 0 to 39,999 and 40,000 to 79,999 board feet per day, reached a historical peak in 1951, then declined 42 percent and 25 percent, respectively, to their 1960 levels. Mills in the 80,000- to 119,999-feet-

DAILY SAWMILL CAPACITY

MILLION BOARD FEET PER DAY LUMBER TALLY

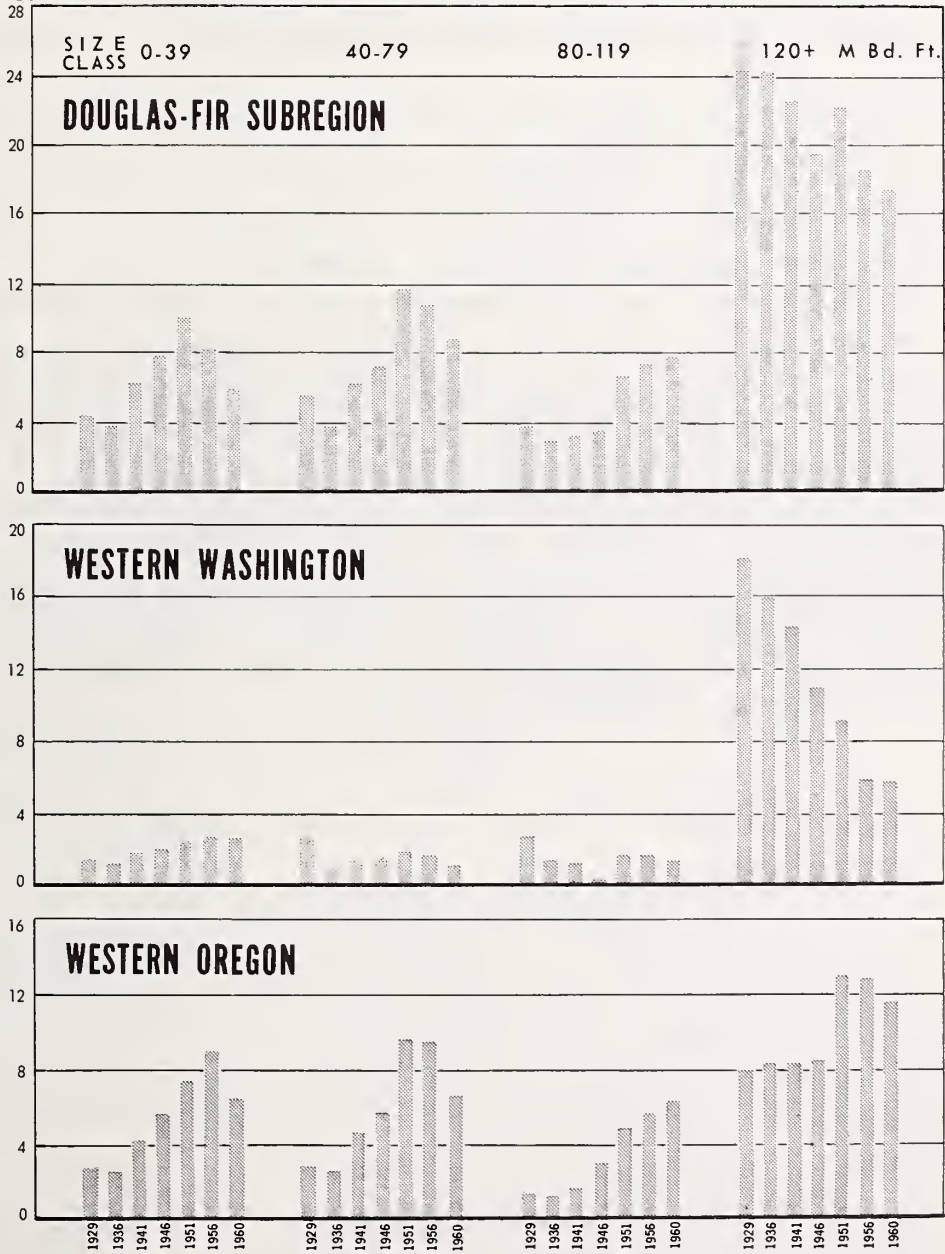


Figure 6. — Daily sawmill capacity by mill size class for Douglas-fir subregion, 1929-60.

per-day class, on the other hand, consistently continued to expand capacity to 1960.

Table 3 presents shifts in share of total annual capacity by mill size class between the early postwar period and the period 1956-58. The biggest change in share of total annual capacity was the decline in relative capacity of the largest size class and the more or less corresponding increase in the 80,000- to 119,999-board-feet-per-day class.

Mills in 80,000- to 119,999-Board-Foot-Per-Day Class Show Continued Growth in Capacity

In the shift of the center of lumber production from western Washington to western Oregon, western Oregon's sawmill capacity expanded in all mill size classes (fig. 6). The greatest expansion between 1929 and 1951 occurred in the 40,000- to 79,999-board-feet-per-day mill size class. In terms of daily capacity, this expansion was about 6.8 million feet. In the same period, mills with 120,000 feet or more capacity per day increased daily capacity 5.1 million feet. Mills in the 0- to 39,999-feet-per-day class and the 80,000- to 119,999-feet-per-day class increased daily capacity 4.5 and 3.8 million feet, respectively. In terms of number of mills, the greatest expansion, of course, occurred in the smallest size class and next in the 40,000- to 79,999-feet-per-day class.

Table 3. — Percent of annual sawmill capacity by mill size class

Period	Mill size class in thousands of board feet per day														
	Douglas-fir subregion					Western Washington					Western Oregon				
	All	0-39	40-79	80-119	120+	All	0-39	40-79	80-119	120+	All	0-39	40-79	80-119	120+
	-----Percent-----														
1948 to 1952	100	13	20	13	54	100	15	16	13	56	100	10	24	22	44
1956 to 1958	100	11	21	20	48	100	11	10	10	69	100	15	25	16	44

After 1951, however, capacity declined in all size classes except the 80,000- to 119,999-feet-per-day class, with the sharpest declines in the two smallest size classes. Daily capacity in the 80,000- to 119,999-feet-per-day class continued to grow an additional 1.4 million board feet to 1960. Unused capacity in this class, moreover, averaged less than 10 percent of its total annual capacity during this period of continued growth. Mills in the 80,000- to 119,999-feet-per-day class, thus, seem to have been well adapted to economic conditions in the postwar period in the Douglas-fir subregion.

The Douglas-Fir Plywood Industry

Softwood plywood has been one of the fastest growing nondefense industries in the postwar period. From 1947-60, its output increased 468 percent — from 1,700 million square feet to 7,952 million square feet (3/8-inch basis). Practically all of the capacity of the softwood plywood industry is located in western Washington, western Oregon, and northern California.

Estimation of Annual Capacity

Annual plywood capacity has been estimated by summing annual capacities reported for individual plants listed in the "Directory of Plywood and Veneer Products" in the annual plywood review issues of *The Lumberman*, 1957-60, and *The Timberman*, 1933-56. Estimates of annual capacity are given in table 4. These estimates include the capacity normally not utilized due to seasonal variations in production. Goddard⁵ has estimated that 11.5 percent of annual plywood capacity was not utilized in 1951 to 1954 as a result of seasonal variation in production.

Relationships in the Subregion

Plywood Capacity Exceeds 9 Billion Square Feet In Pacific Northwest

In 1960, the plywood capacity in the Pacific Northwest⁶ was 9,172 million square feet. This was an increase of 422 percent from 1947 when capacity was 2,176 million square feet.

The Douglas-fir plywood industry had its beginnings in Portland, Oreg., in 1905. Its growth in capacity since that time can be divided into five periods, each having a distinctly different growth rate:

Period	Number of years	Increase in capacity	Average annual increase
— — — — — Million square feet — — — — —			
1905-33	28	671	24.0
1933-40	7	1,096	156.7
1940-47	7	409	58.4
1947-54	7	2,154	307.7
1954-60	6	4,688	781.3

⁵ Goddard, Everett Earl. An analysis of the problem of industrial productivity measurement as applied to the Douglas-fir plywood industry. pp. 247-258. Doctoral thesis on file at University of Washington, Seattle. 1956.

⁶ Includes all of Idaho, Montana, Oregon, and Washington since production data cannot be separated for western Oregon and western Washington. Plant capacity in Idaho and Montana, however, was less than 1 percent of the total for the Pacific Northwest from 1952 to 1958, and 1.3 and 2.3 percent in 1959 and 1960, respectively.

Its growth pattern is marked by continuous acceleration to 1960 (fig. 7). From 1958 to 1960, for example, the average annual increase in capacity was 1,069 million square feet, the highest historical rate for any 2-year period.

CAPACITY and PRODUCTION -- PLYWOOD

BILLION SQUARE FEET, 3/8-INCH BASIS

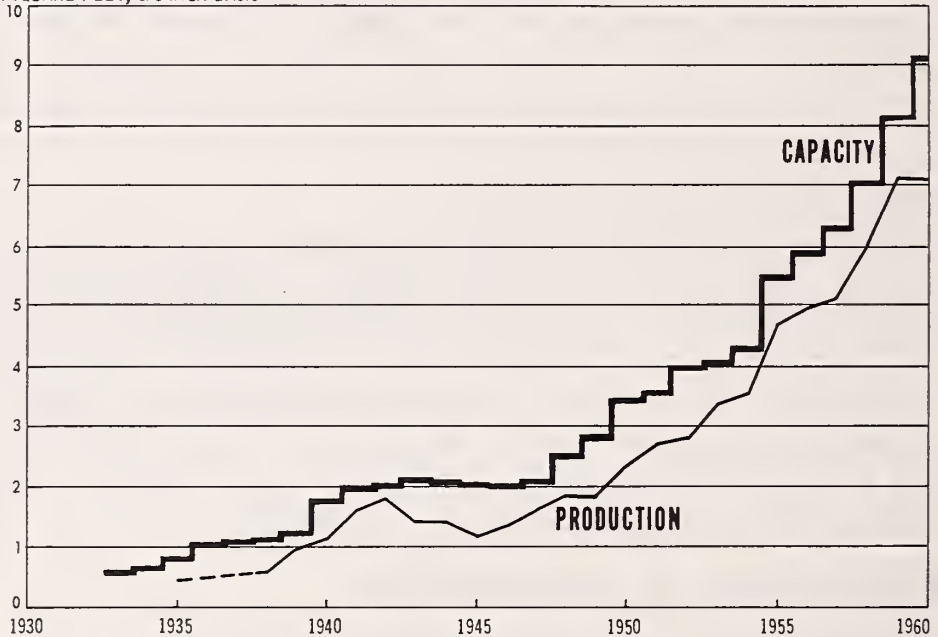


Figure 7.—Annual capacity and production of the plywood industry in the Pacific Northwest, 1933-60.

Plywood Production Lags Behind Expansion

In 1960, plywood production in the Pacific Northwest was 7,103 million square feet, or 86 percent of the national softwood plywood production.

Except for the war years, 1940-45, growth in plywood capacity led expansion of production by an average of about 3 years. From 1947-59, unused capacity averaged 914 million square feet. Percentagewise, it declined from an average of 29 percent in the first half of this period to 15 percent in the second half.

In 1960, production dropped below that of the previous year for the first time since 1949. Capacity, however, continued to increase by an additional 1,026 million square feet. As a consequence, unused capacity rose to a historical peak of 2,069 million square feet, or 23 percent, as shown in table 4. In this year, it became evident that the industry was confronted

with a serious problem of excess capacity, overproduction, and depressed prices. Unused plywood capacity in Oregon in 1960 was 1,339 million square feet, or 20 percent. In Washington, it was 730 million square feet, or 32 percent.

Absolute and Relative Plywood Prices Decline

During the early phase of the postwar expansion, 1950-52, the Douglas-fir plywood wholesale price index (1947-49 = 100) averaged 115.1, its highest historical level. By the end of the decade, 1958-60, the index had dropped to 92.3 (fig. 8, upper panel).

The relative price of softwood plywood, i.e., the wholesale price index for Douglas-fir plywood divided by the wholesale price index for all commodities, dropped even more sharply during this period—from 104.9 to 77.2.

Table 4. — Annual capacity and production of the plywood industry in the Pacific Northwest, 1933-60¹

Year	Production	Capacity	Unused Capacity	
			Amount	Percent of capacity
	MM sq. ft. ²	MM sq. ft. ²	MM sq. ft. ²	
1933	--	671	--	--
1934	--	721	--	--
1935	480	876	396	45
1936	--	1,086	--	--
1937	--	1,145	--	--
1938	650	1,163	513	44
1939	950	1,329	379	29
1940	1,200	1,767	567	32
1941	1,620	2,010	390	19
1942	1,782	2,081	299	14
1943	1,430	2,194	764	35
1944	1,440	2,172	732	34
1945	1,200	2,131	931	44
1946	1,395	2,065	670	32
1947	1,625	2,176	551	25
1948	1,828	2,590	762	29
1949	1,814	2,789	975	35
1950	2,384	3,476	1,092	31
1951	2,702	3,579	877	25
1952	2,838	3,994	1,156	29
1953	3,376	4,176	800	19
1954	3,575	4,330	755	17
1955	4,767	5,534	767	14
1956	4,934	5,927	993	17
1957	5,182	6,355	1,173	18
1958	6,052	7,034	982	14
1959	7,150	8,146	996	12
1960	7,103	9,172	2,069	23

¹ Idaho and Montana included for years 1951-60. ² 3/8-inch basis.
Sources for production: U. S. Bureau of the Census "Facts for Industry" series for the years 1947-60.

Douglas Fir Plywood Association Bul. No. 2800, 1960, for years prior to 1947; includes hardwood plywood production beginning with 72 million square feet in 1951 and amounting to 444 million square feet in 1960.

Sources for capacity: Directories of plywood and veneer products in annual plywood review issues of The Lumberman, 1957-60, and The Timberman, 1933-56.

An industry effort in 1960 to maintain more favorable prices by self-imposed production restrictions revealed the highly competitive character of many producers. Many smaller producers continued to produce at or near capacity. Although a reduction of production among the larger firms kept total annual production from expanding, it was insufficient to keep plywood prices from falling to a new low level.

Relationships with Lumber Industry

Plywood Competes with Lumber for Markets

In recent years, the competitive relationships between plywood and lumber changed markedly. Plywood used for sheathing, subflooring, roofing, and other construction purposes has captured a substantial segment of traditional lumber markets.

The increased competition between plywood and lumber is marked by divergent price trends as illustrated in figure 8. During the period 1947-54, the ratio of the wholesale price index for the Douglas-fir subregion averaged 102.6. While the following years, 1955-60, represented the most rapid growth in plywood capacity and production, the ratio fell to 80.9 in 1960.

Plywood Also Competes with Lumber for Log Supplies

Log requirements of the plywood industry in 1940 were approximately 500 million board feet, about 6 percent of the total log output of the Douglas-fir subregion. In 1950, the industry was using 10 percent of the total log production of the subregion and in 1960, 27 percent, nearly 3 billion board feet per year.

Expanding use of lower grade plywood for construction items has made No. 1 and No. 2 sawmill logs standard raw material for much of the plywood output. Sheathing grades of plywood, which use only C- and D-grade veneers, now comprise close to 30 percent of the plywood output. Only 46 percent⁷ of the output in 1957 required an A-grade face; less than 4 percent required two A-grade faces.

With more or less stable level of log production in the subregion during the 1950 decade, it is obvious that the plywood industry increased its log supply from part of the production which formerly had gone into lumber.

⁷ Anonymous. State of the industry. *The Lumberman* 85(1): 67. 1958.

PLYWOOD and LUMBER PRICE RELATIONSHIPS

INDEX (1947-49 = 100)

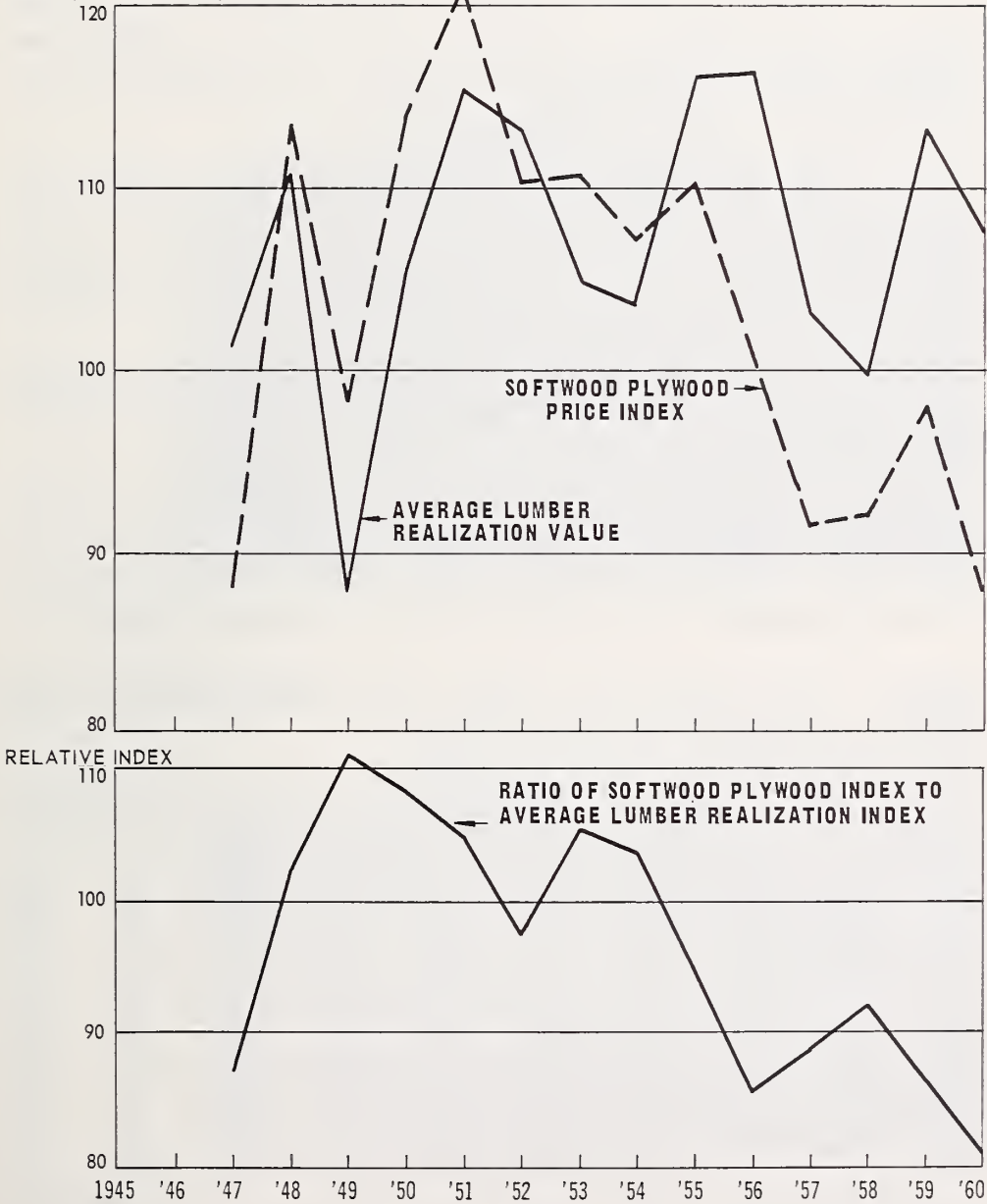


Figure 8.—Price relationships between softwood plywood and lumber from Douglas-fir subregion, 1945-60.

Plywood Capacity Increase Offsets Lumber Capacity Decrease

The capacity of the lumber industry in the subregion reached a peak in 1951 of 12.0 billion board feet, lumber tally, or 9.6 billion feet, log scale. Plywood capacity in 1951 was 3.6 billion square feet, or 1.5 billion feet, log scale.⁸ The combined capacity, measured in terms of common log input units, was 11.1 billion board feet, log scale.

From 1951 to 1960, the combined capacity showed little change, averaging 11.0 billion board feet, log scale, with an average deviation of only 2 percent (table 5, fig. 9). As indicated earlier, this was accompanied by substantial reduction of lumber manufacturing throughout the Douglas-fir subregion.

The combined output of both industries in 1951 amounted to 9.0 billion board feet, log scale, and averaged 9.3 billion feet in the period 1951-60 (table 5, fig. 9).

The unused capacity in the lumber and plywood industries amounted to about 0.8 billion board feet, log scale, in 1959. In 1960, however, it was up to 2.1 billion feet, log scale (table 5), due to continued expansion of plywood capacity and a substantial decline in lumber production.

Table 5. — Annual plywood and lumber capacity and production for the Douglas-fir subregion, 1946-60

Year	Capacity			Production			Unused capacity		
	Lumber	Plywood	Total	Lumber	Plywood ¹	Total	Lumber	Plywood	Total
	— — — — — Million board feet, Scribner log scale — — — — —								
1946	7,253	860	8,113	6,268	581	6,849	985	279	1,264
1947	8,295	907	9,202	7,170	677	7,847	1,125	230	1,355
1948	8,628	1,080	9,708	7,524	762	8,286	1,104	318	1,422
1949	8,674	1,159	9,833	7,308	756	8,064	1,366	403	1,769
1950	8,817	1,449	10,266	8,086	993	9,079	731	456	1,187
1951	9,631	1,491	11,122	7,880	1,126	9,006	1,751	365	2,116
1952	9,520	1,655	11,175	8,291	1,174	9,465	1,229	481	1,710
1953	9,043	1,724	10,767	7,796	1,395	9,191	1,247	329	1,576
1954	8,902	1,787	10,689	7,426	1,476	8,902	1,476	311	1,787
1955	9,189	2,291	11,480	7,730	1,972	9,702	1,459	319	1,778
1956	8,550	2,451	11,001	7,007	2,041	9,048	1,543	410	1,953
1957	8,214	2,628	10,842	6,362	2,145	8,507	1,852	483	2,335
1958	7,781	2,912	10,693	6,751	2,506	9,257	1,030	406	1,436
1959	7,627	3,349	10,976	7,283	2,941	10,224	344	408	752
1960	7,570	3,822	11,392	6,423	2,892	9,315	1,147	930	2,077

¹ Based on plywood production for the Pacific Northwest from table 4 less plywood capacity of Idaho and Montana, after reduction by the percentage of unused capacity reported in table 5 for the Pacific Northwest.

⁸ Conversion factors: 125 board feet, lumber tally, per 100 board feet, Scribner log scale; 240 square feet of 3/8-inch plywood per 100 board feet, Scribner log scale. All board-foot lag volumes in this report are in Scribner log scale. Conversion factors based on unpublished studies of the Pacific Northwest Forest and Range Experiment Station and the following publications:

Clarke, E. H., and Knauss, A. C. Veneer recovery from Douglas-fir lags. U. S. Forest Serv. Pac. NW. Forest & Range Expt. Sta. Res. Paper 23, 13 pp. 1957.

Matsen, E. E. Lumber grades from old-growth Douglas-fir sawmill logs. U. S. Forest Serv. Pac. NW. Forest & Range Expt. Sta. Res. Note 125, 2 pp. plus tables and figures. 1956.

TRENDS in CAPACITY and PRODUCTION

BILLION BOARD FEET, SCRIBNER LOG SCALE

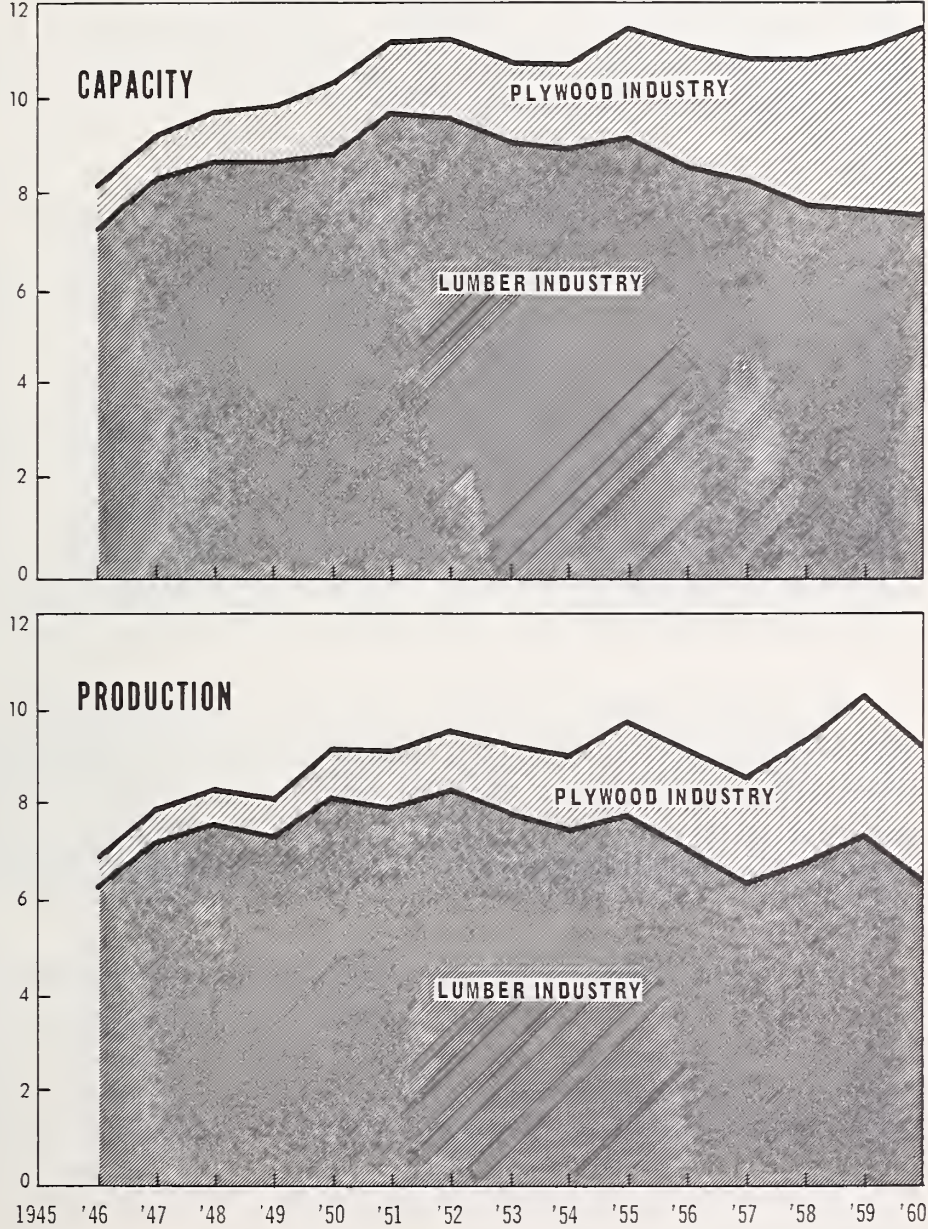


Figure 9.—Trends in plywood and lumber capacity and production in the Douglas-fir subregion, in terms of log consumption, 1946-60.

Plywood and Lumber Production Integrated More Widely

As plywood capacity expanded in the subregion and plywood-log consumption increased, the degree of integration between the lumber and plywood industries increased, as shown in table 6. In 1960, 43 percent of the plywood capacity was integrated with lumber production. In Oregon, integrated capacity reached 47 percent of total plywood capacity and in Washington, 34 percent.

Table 6. — Degree of integration of plywood and lumber capacity under the same ownership, Douglas-fir subregion, 1937-60

Item		1937	1950	1955	1960
Douglas-fir subregion:					
Total plywood capacity	Million sq. ft.	1,145	3,476	5,495	8,958
Capacity integrated with lumber	Million sq. ft.	368	1,069	2,199	3,888
Percent integrated		32	31	40	43
Oregon:					
Total plywood capacity	Million sq. ft.	144	1,552	3,378	6,668
Capacity integrated with lumber	Million sq. ft.	54	405	1,573	3,113
Percent integrated		38	26	47	47
Washington:					
Total plywood capacity	Million sq. ft.	1,001	1,924	2,117	2,290
Capacity integrated with lumber	Million sq. ft.	314	664	626	775
Percent integrated		31	35	30	34

Source: Directories of plywood and veneer products in annual plywood review issues of The Lumberman and The Timberman.

The greatest absolute increase in integration of plywood with lumber came between 1955 and 1960 when total plywood capacity was expanding at the highest rate in history. In that period, 1.7 billion square feet, 3/8-inch basis, of plywood capacity was integrated with lumber production. It was during this period also that plywood prices dropped most drastically (fig. 8).

The trend of integration between plywood and lumber has been associated entirely with sawmills having a daily capacity of 80,000 board feet or more. The economy of such integration probably accounts in part for the continued expansion of capacity of sawmills in the 80,000- to 119,999-board-feet-per-day size class and the relatively small attrition in Oregon of sawmills of larger than 120,000-board-feet-per-day capacity.

Relationships in States and Subareas

Center of Plywood Industry Shifted to Oregon

The location of the Douglas-fir plywood industry, like the lumber industry, is oriented toward log supply sources but to a lesser degree. In the prewar period, for example, Washington led Oregon in total log pro-

duction, with the Puget Sound area accounting for a third or more of the total log output of the Douglas-fir subregion. Until 1947, two-thirds or more of the subregion's plywood capacity continued to be located in Washington, with 50 percent or more in the Puget Sound area.

After 1941, the center of log production and lumber manufacture shifted to Oregon, with the heaviest concentration in southwestern Oregon. Plywood production shifted similarly, but 10 years later, in 1952, Oregon's plywood output surpassed Washington's for the first time (fig. 10, tables 7 and 8).

From 1947 to 1960, Washington's plywood capacity increased only 870 million square feet, or 60 percent. Oregon's expansion was 5,932 million square feet, or more than 800 percent.

Plywood Capacity Expands in Western Washington As Lumber Declines

From 1947 to 1960, plywood capacity in western Washington increased 354 million board feet, log scale, while lumber capacity declined 916 million feet, log scale. The combined capacity accordingly declined 562 million feet, from 3.8 billion board feet, log scale, to 3.2 billion feet (fig. 11, table 9).

Log production, on the other hand, remained relatively stable — averaging 3.7 billion board feet after 1947 with an average deviation of 10.8 percent.⁹ Economic conditions obviously favored the plywood industry in western Washington in the postwar period. Plywood capacity increased from 16 percent to 29 percent of the combined plywood and lumber capacity.

One-third of Western Oregon's Lumber and Plywood Capacity in Plywood

The combined capacity of the lumber and plywood industries in western Oregon was 8.1 billion board feet, log scale, in 1960 — an increase of 2.7 billion board feet since 1947. In 1960, plywood constituted 34 percent of the total capacity; in 1947, it was only 6 percent.

The initial increase in total capacity in western Oregon in the postwar period came largely in the lumber industry. Lumber capacity increased from 5.1 billion feet, log scale, in 1947 to 6.7 billion feet in 1951. Plywood increased only 447 million board feet, log scale, in the same period.

⁹ A substantial proportion of Washington's log production is used for pulpwood consumption.

PLYWOOD CAPACITY and PRODUCTION by SUBAREAS

BILLION SQUARE FEET

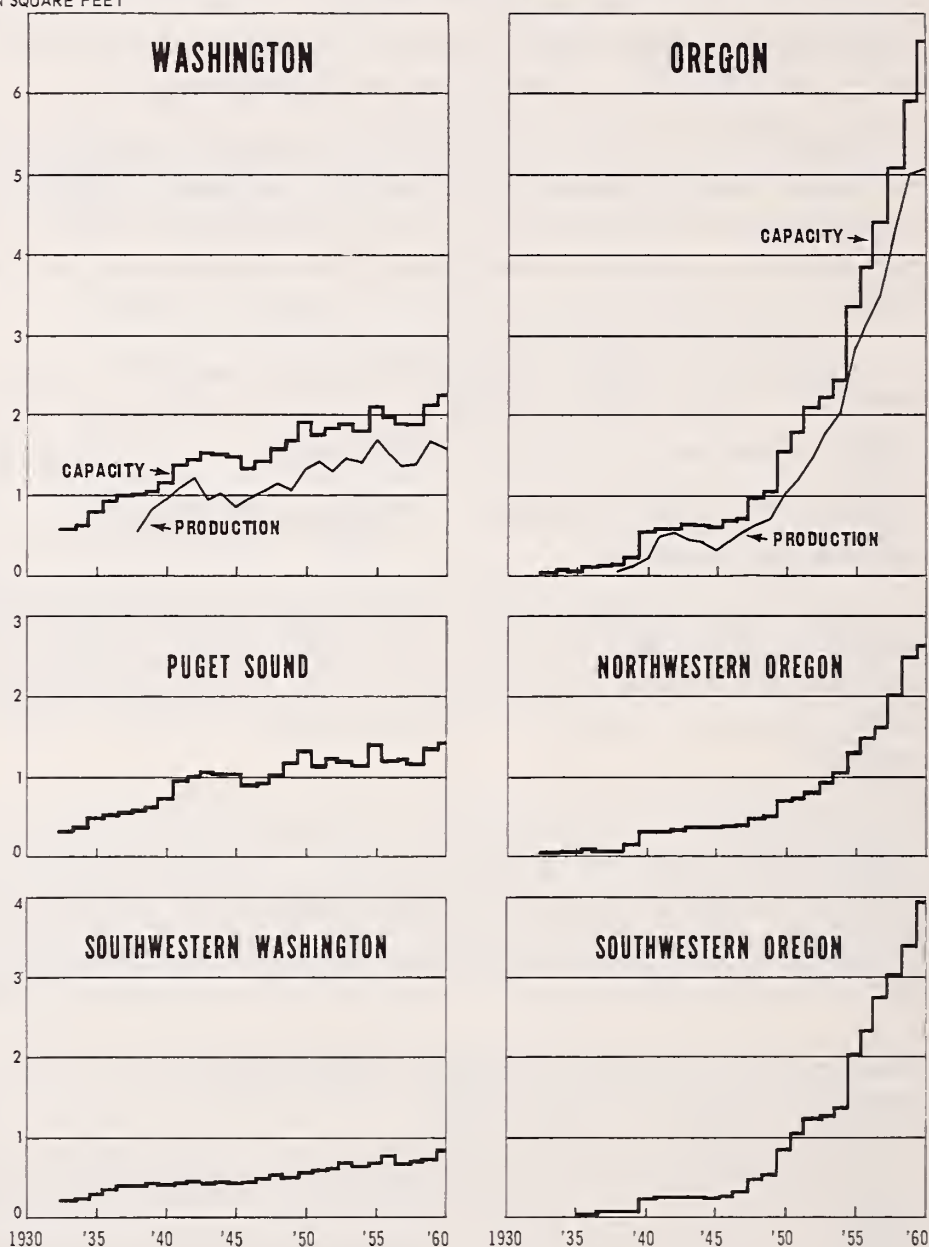


Figure 10.—Annual softwood plywood production and capacity in Washington and Oregon and subareas, 1933-60. (Production data not available separately for subareas. Washington production includes Idaho and Montana output for years 1952-60. Hardwood plywood production not included for either State.)

Table 7. — Annual plywood capacity by State and subareas, 1933-60

Year	Washington			Oregon			Idaha and Mantana
	Puget Saund	Sauth- western ¹	Total	North- western	Sauth- western ²	Total	
	— — — — — Million square feet, 3/8-inch basis — — — — —						
1933	377	240	617	54	--	54	--
1934	405	252	657	64	--	64	--
1935	506	300	806	70	--	70	--
1936	570	380	950	96	40	136	--
1937	596	405	1,001	90	54	144	--
1938	605	405	1,010	90	63	153	--
1939	648	437	1,085	170	74	244	--
1940	757	428	1,185	332	250	582	--
1941	967	433	1,400	352	258	610	--
1942	1,018	453	1,471	352	258	610	--
1943	1,086	453	1,539	397	258	655	--
1944	1,063	463	1,526	382	264	646	--
1945	1,060	433	1,493	386	252	638	--
1946	929	436	1,365	412	288	700	--
1947	944	496	1,440	424	312	736	--
1948	1,041	555	1,596	496	498	994	--
1949	1,199	511	1,710	537	542	1,079	--
1950	1,338	586	1,924	705	847	1,552	--
1951	1,166	603	1,769	747	1,063	1,810	--
1952	1,250	619	1,869	817	1,287	2,104	21
1953	1,209	693	1,902	955	1,283	2,238	36
1954	1,174	646	1,820	1,082	1,389	2,471	39
1955	1,428	689	2,117	1,336	2,042	3,378	39
1956	1,228	770	1,998	1,515	2,370	3,885	44
1957	1,240	670	1,910	1,615	2,786	4,401	44
1958	1,198	706	1,904	2,009	3,077	5,086	44
1959	1,390	730	2,120	2,518	3,400	5,918	108
1960	1,453	837	2,290	2,682	3,986	6,668	214

¹ Includes small amount in eastern Washington, 1958-60.

² Includes small amount in eastern Oregon, 1952-60.

Table 8. — Annual plywood production by State, 1938-60

Year	Softwaad plywaad		Hardwaad plywaad		
	Washington ¹	Oregon	Washington ¹	Oregon	Total
	— — — — — Million square feet, 3/8-inch basis — — — — —				
1938	580	70	--	--	--
1939	833	117	--	--	--
1940	964	236	--	--	--
1941	1,123	497	--	--	--
1942	1,230	552	--	--	--
1943	952	478	--	--	--
1944	1,012	428	--	--	--
1945	878	322	--	--	--
1946	963	432	--	--	--
1947	1,067	558	--	--	--
1948	1,174	654	--	--	--
1949	1,091	723	--	--	--
1950	1,338	1,046	--	--	--
1951	1,428	1,202	--	--	72
1952	1,315	1,446	--	--	77
1953	1,478	1,803	--	--	95
1954	1,434	2,014	--	--	127
1955	1,691	2,856	--	--	220
1956	1,527	3,180	--	--	227
1957	1,384	3,510	--	--	288
1958	1,402	4,233	--	--	417
1959	1,673	5,003	--	--	474
1960	1,580	5,083	194	246	440

¹ Idaha and Mantana included for years 1951-60.
 Sources for softwaad plywaad: U. S. Bureau of the Census "Facts for Industry" series, 1947-60; Douglas Fir Plywaad Association Bul. Na. 2800, 1960, for years prior to 1947.
 Sources for hardwaad plywaad: "State of the Industry," in the annual plywaad review issues of The Lumberman, 1957-60, and The Timberman for years before 1957. Sources do not separate hardwaad plywaad production by States until 1960.

Table 9. — Annual lumber and plywood capacity in western Washington, 1933-60

Year	Puget Sound			Southwestern Washington			Western Washington		
	Plywood	Lumber	Total	Plywood ¹	Lumber	Total	Plywood ¹	Lumber	Total
	— Million board feet, Scribner log scale —								
1933	157	3,256	3,413	100	1,611	1,711	257	4,867	5,124
1934	169	3,231	3,400	105	1,661	1,766	274	4,892	5,166
1935	211			125			335		
1936	238	2,591	2,829	158	1,316	1,474	396	3,907	4,303
1937	248	2,759	3,007	169	1,538	1,707	417	4,297	4,714
1938	252	2,614	2,866	169	1,422	1,591	421	4,036	4,457
1939	270			182			452		
1940	316	2,277	2,593	178	1,294	1,472	494	3,571	4,065
1941	403	2,325	2,728	180	1,321	1,501	583	3,646	4,229
1942	424	2,144	2,568	189	1,225	1,414	613	3,369	3,982
1943	452	1,997	2,449	189	1,168	1,357	641	3,165	3,806
1944	442	1,672	2,114	193	1,150	1,343	635	2,822	3,457
1945	442			180			622		
1946	387	1,801	2,188	182	1,093	1,275	569	2,894	3,463
1947	393	2,047	2,440	207	1,142	1,349	600	3,189	3,789
1948	434	2,103	2,537	231	1,107	1,338	665	3,210	3,875
1949	498	1,929	2,427	212	1,065	1,277	710	2,994	3,704
1950	558	1,796	2,354	244	1,111	1,355	802	2,907	3,709
1951	486	1,737	2,223	251	1,206	1,457	737	2,943	3,680
1952	520	1,770	2,290	258	1,108	1,366	778	2,878	3,656
1953	505	1,696	2,201	288	912	1,200	793	2,608	3,401
1954	489	1,645	2,134	269	920	1,189	758	2,565	3,323
1955	596	1,545	2,141	287	929	1,216	883	2,474	3,357
1956	512	1,464	1,976	320	819	1,139	832	2,283	3,115
1957	516	1,412	1,928	279	826	1,105	795	2,238	3,033
1958	499	1,411	1,910	294	760	1,054	793	2,171	2,964
1959	579	1,517	2,096	304	735	1,039	883	2,252	3,135
1960	605	1,530	2,135	349	764	1,113	954	2,294	3,248

¹ Includes small amount of plywood capacity in eastern Washington, 1958-60.

Table 10. — Western Oregon annual lumber and plywood capacity, 1933-60

Year	Northwestern Oregon			Southwestern Oregon			Western Oregon		
	Plywood	Lumber	Total	Plywood ¹	Lumber	Total	Plywood ¹	Lumber	Total
	Million board feet, Scribner log scale								
1933	22	1,832	1,854	--	1,044	1,044	22	2,876	2,898
1934	27	2,063	2,090	--	1,062	1,062	27	3,125	3,152
1935	29						29		
1936	41	1,691	1,732	16	1,285	1,301	57	2,976	3,033
1937	37	1,757	1,794	22	1,234	1,256	59	2,991	3,050
1938	37	1,773	1,810	26	1,247	1,273	63	3,020	3,083
1939	71			31			102		
1940	138	1,715	1,853	104	1,590	1,694	242	3,305	3,547
1941	147	1,985	2,132	107	1,653	1,760	254	3,638	3,892
1942	147	2,043	2,190	107	1,821	1,928	254	3,864	4,118
1943	166	2,100	2,266	107	1,920	2,027	273	4,020	4,293
1944	159	1,915	2,074	110	1,897	2,007	269	3,812	4,081
1945	161			105			266		
1946	171	2,008	2,179	120	2,351	2,471	291	4,359	4,650
1947	177	2,239	2,416	130	2,867	2,997	307	5,106	5,413
1948	207	2,452	2,659	208	2,966	3,174	415	5,418	5,833
1949	223	2,582	2,805	226	3,098	3,324	449	5,680	6,129
1950	294	2,715	3,009	353	3,195	3,548	647	5,910	6,557
1951	311	3,004	3,315	443	3,685	4,128	754	6,689	7,443
1952	340	2,875	3,215	537	3,767	4,304	877	6,642	7,519
1953	398	2,833	3,231	535	3,603	4,138	933	6,436	7,369
1954	450	2,630	3,080	579	3,707	4,286	1,029	6,337	7,366
1955	557	2,699	3,256	851	4,015	4,866	1,408	6,714	8,122
1956	632	2,475	3,107	987	3,791	4,778	1,619	6,266	7,885
1957	673	2,458	3,131	1,160	3,519	4,679	1,833	5,977	7,810
1958	837	2,170	3,007	1,282	3,440	4,722	2,119	5,610	7,729
1959	1,049	2,171	3,220	1,416	3,204	4,620	2,465	5,375	7,840
1960	1,117	2,063	3,180	1,661	3,214	4,875	2,778	5,277	8,055

¹ Includes small amount of plywood capacity in eastern Oregon, 1952-60.

After 1951, however, lumber capacity declined 1.4 billion feet, log scale. In 1960, it had almost reached its 1947 level. Plywood, on the other hand, increased capacity 2.0 billion board feet, log scale, more than replacing the reduction in lumber capacity (fig. 11, table 10).

LUMBER and PLYWOOD CAPACITY

BILLION BOARD FEET, SCRIBNER LOG SCALE

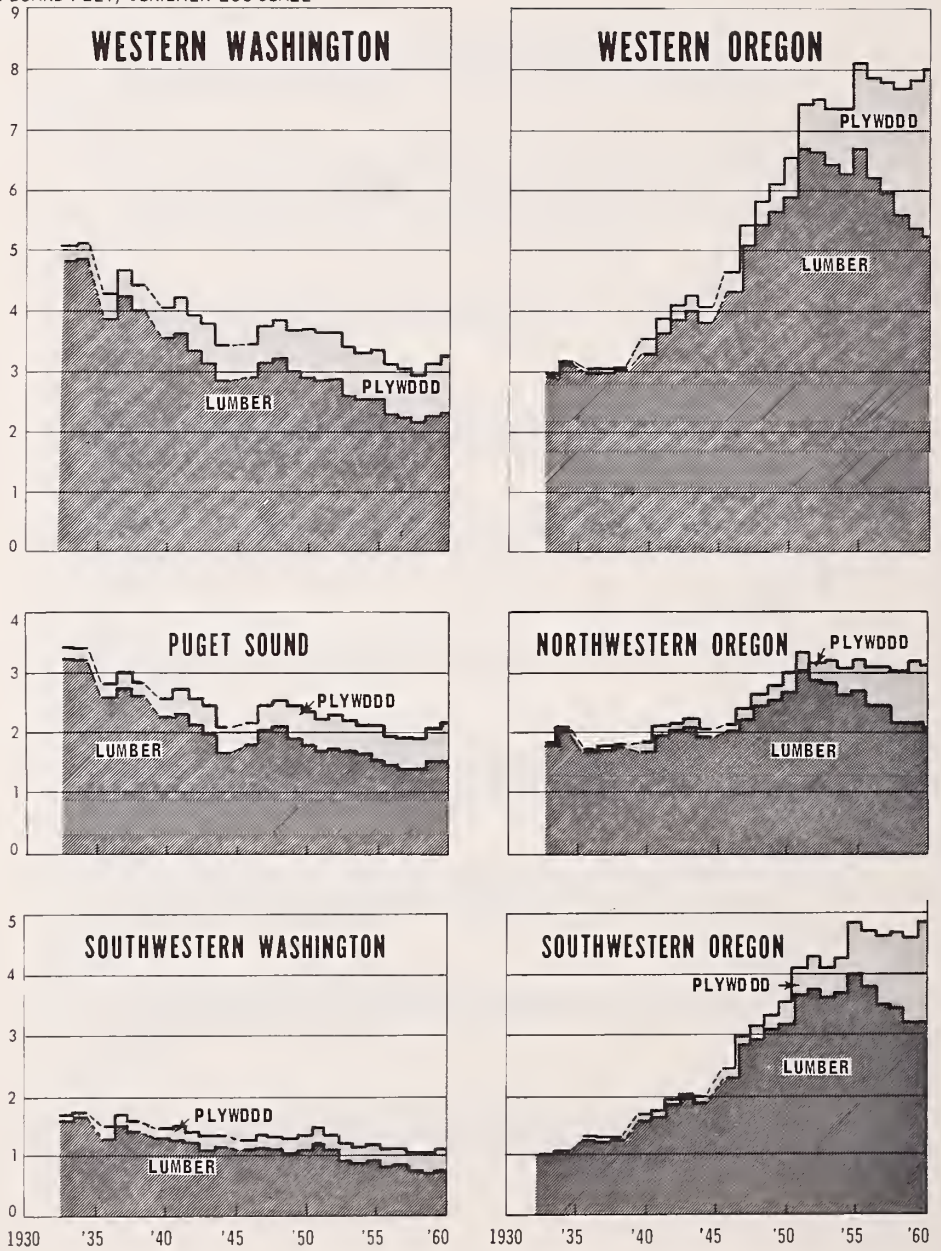


Figure 11.—Annual lumber and plywood capacity for western Washington, western Oregon, and subareas, in terms of log consumption, 1933-60.

The Pulp Industry

Estimation of Annual Capacity

Estimates of annual pulp capacity are based upon figures for 24-hour capacity for mills as reported in Lockwood's "Directory of the Paper and Allied Trades." These include hardboard and insulating board mills using a pulping process. Daily capacity was expanded to annual capacity by assuming 350 days of operation. This was the average ratio of reported annual pulp production to reported daily capacity for mills in Washington between 1947 and 1957.

Because pulp production and pulpwood consumption are not reported for portions of a State, this analysis includes eastern Washington and eastern Oregon, where 6 percent of the pulp capacity of these States is located. Alaska's pulp production, which the Bureau of the Census includes with Washington's for years 1955 to 1960, is estimated and excluded.

Nearly One-sixth of Nation's Pulp Capacity In Pacific Northwest

The annual pulp capacity of Washington and Oregon in 1960 was 4,543,000 tons, constituting approximately 16 percent of the pulp capacity of the United States. Pulp production in 1960 was 3,856,000 tons, giving an unused capacity of 687,000 tons, or 15 percent (fig. 12, tables 11 and 12).

Pulp Capacity Expands Steadily

Although the pulp industry carried a substantial unused capacity from 1929 to 1940, its capacity expanded consistently in this period at an average rate of 86,000 tons per year. During the war years, expansion slowed considerably (fig. 12). From 1947 to 1960, however, the average annual growth rate rose to 179,000 tons, and pulp capacity in Washington and Oregon increased more than 100 percent.

The postwar expansion in pulp capacity up to 1956 was closely tied to demand, for the installed capacity essentially was fully utilized. Following 1956, however, production failed to stay abreast of the high rate of expansion. Unused capacity rose to 700,000 tons, or 17 percent, and remained at that level through 1960 (table 12).

Table 11. — Annual capacity of pulp industry in Washington, Oregon, and subareas, 1929-60

Year	Washington			Subtotal	Oregon			Subtotal	Total
	Puget Sound	South-western	Eastern		North-western	South-western	Eastern		
					Thousand tons				
1929	373	302	40	715	378	18	--	396	1,111
1930	--	--	--	--	--	--	--	--	--
1931	--	--	--	--	--	--	--	--	--
1932	564	362	47	973	433	0	--	433	1,406
1933	--	--	--	--	--	--	--	--	--
1934	580	362	47	989	435	0	--	435	1,424
1935	--	--	--	--	--	--	--	--	--
1936	643	396	47	1,086	435	24	--	459	1,545
1937	--	--	--	--	--	--	--	--	--
1938	908	478	47	1,433	475	24	--	499	1,932
1939	--	--	--	--	--	--	--	--	--
1940	961	544	47	1,552	476	24	--	500	2,052
1941	--	--	--	--	--	--	--	--	--
1942	1,085	574	47	1,706	485	24	--	509	2,215
1943	--	--	--	--	--	--	--	--	--
1944	--	--	--	--	--	--	--	--	--
1945	975	576	47	1,598	485	24	--	509	2,107
1946	--	--	--	--	--	--	--	--	--
1947	1,043	600	59	1,702	487	24	--	511	2,213
1948	--	--	--	--	--	--	--	--	--
1949	1,108	735	59	1,902	557	24	--	581	2,483
1950	1,118	735	59	1,912	536	80	--	616	2,528
1951	1,153	759	50	1,962	550	112	--	662	2,624
1952	--	--	--	--	--	--	--	--	--
1953	1,256	792	50	2,098	615	156	--	771	2,869
1954	1,381	841	50	2,272	613	156	91	860	3,132
1955	1,452	1,022	50	2,524	673	161	91	925	3,449
1956	1,497	1,128	50	2,675	720	161	91	972	3,647
1957	1,514	1,195	50	2,759	750	178	91	1,019	3,778
1958	1,548	1,260	50	2,858	886	189	161	1,236	4,094
1959	1,548	1,384	102	3,034	935	189	161	1,285	4,319
1960	1,584	1,449	120	3,153	1,040	189	161	1,390	4,543

Table 12. — Annual pulp production and unused pulp capacity in Washington and Oregon, 1925-60

Year	Production			Unused Capacity ¹					
	Washington	Oregon	Total	Washington	Oregon	Total	Washington	Oregon	Total
	M tons	M tons	M tons	M tons	M tons	M tons	Percent	Percent	Percent
1925	162	161	323	--	--	--	--	--	--
1926	--	--	--	--	--	--	--	--	--
1927	268	201	469	--	--	--	--	--	--
1928	--	--	--	--	--	--	--	--	--
1929	524	*256	780	190	139	329	27	35	30
1930	566	*249	815	--	--	--	--	--	--
1931	580	238	818	--	--	--	--	--	--
1932	421	187	608	552	246	798	57	57	57
1933	584	189	773	--	--	--	--	--	--
1934	709	240	949	280	195	475	28	45	33
1935	776	262	1,038	--	--	--	--	--	--
1936	896	303	1,199	189	156	345	17	34	22
1937	1,184	339	1,523	--	--	--	--	--	--
1938	837	251	1,088	596	248	844	42	50	44
1939	1,126	288	1,414	109	104	213	7	21	10
1940	1,443	396	1,839	--	--	--	--	--	--
1941	1,610	--	--	133	--	--	8	--	--
1942	1,573	--	--	--	--	--	--	--	--
1943	1,153	--	--	--	--	--	--	--	--
1944	1,256	--	--	--	--	--	--	--	--
1945	1,265	361	1,626	332	149	481	21	29	23
1946	1,333	407	1,740	--	--	--	--	--	--
1947	1,591	436	2,027	111	75	186	7	15	8
1948	--	--	--	--	--	--	--	--	--
1949	--	--	--	--	--	--	--	--	--
1950	1,871	527	2,398	41	89	130	2	14	5
1951	2,065	625	2,690	(103)	37	(66)	(5)	6	(3)
1952	2,068	616	2,684	--	--	--	--	--	--
1953	2,158	650	2,808	(60)	121	61	(3)	16	2
1954	2,383	682	3,065	(112)	178	66	(5)	21	2
1955	2,572	834	3,406	(47)	90	43	(2)	10	1
1956	2,674	930	3,604	0	42	42	0	4	1
1957	2,641	897	3,538	117	122	239	4	12	6
1958	2,448	970	3,418	445	266	711	15	22	17
1959	2,555	1,023	3,578	515	262	777	17	20	18
1960	2,822	1,034	3,856	331	356	687	10	26	15

¹ Parentheses indicate excess of production over estimated capacity

² Includes small amount from California.

Source for production: U. S. Bureau of the Census reports.

CAPACITY and PRODUCTION --PULP

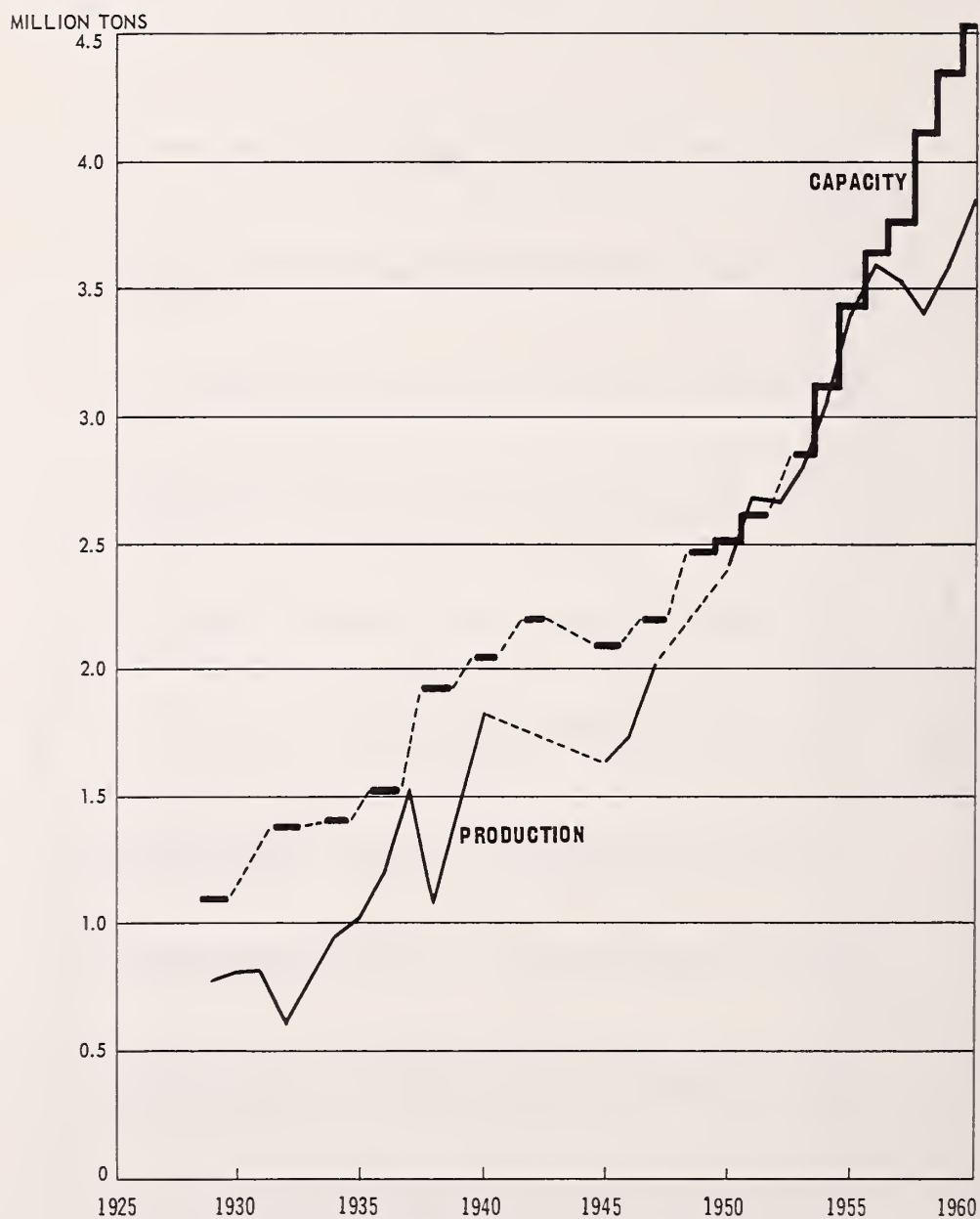


Figure 12.—Annual pulp capacity and production in Washington and Oregon, 1929-60.

PULP CAPACITY and PRODUCTION by SUBAREAS

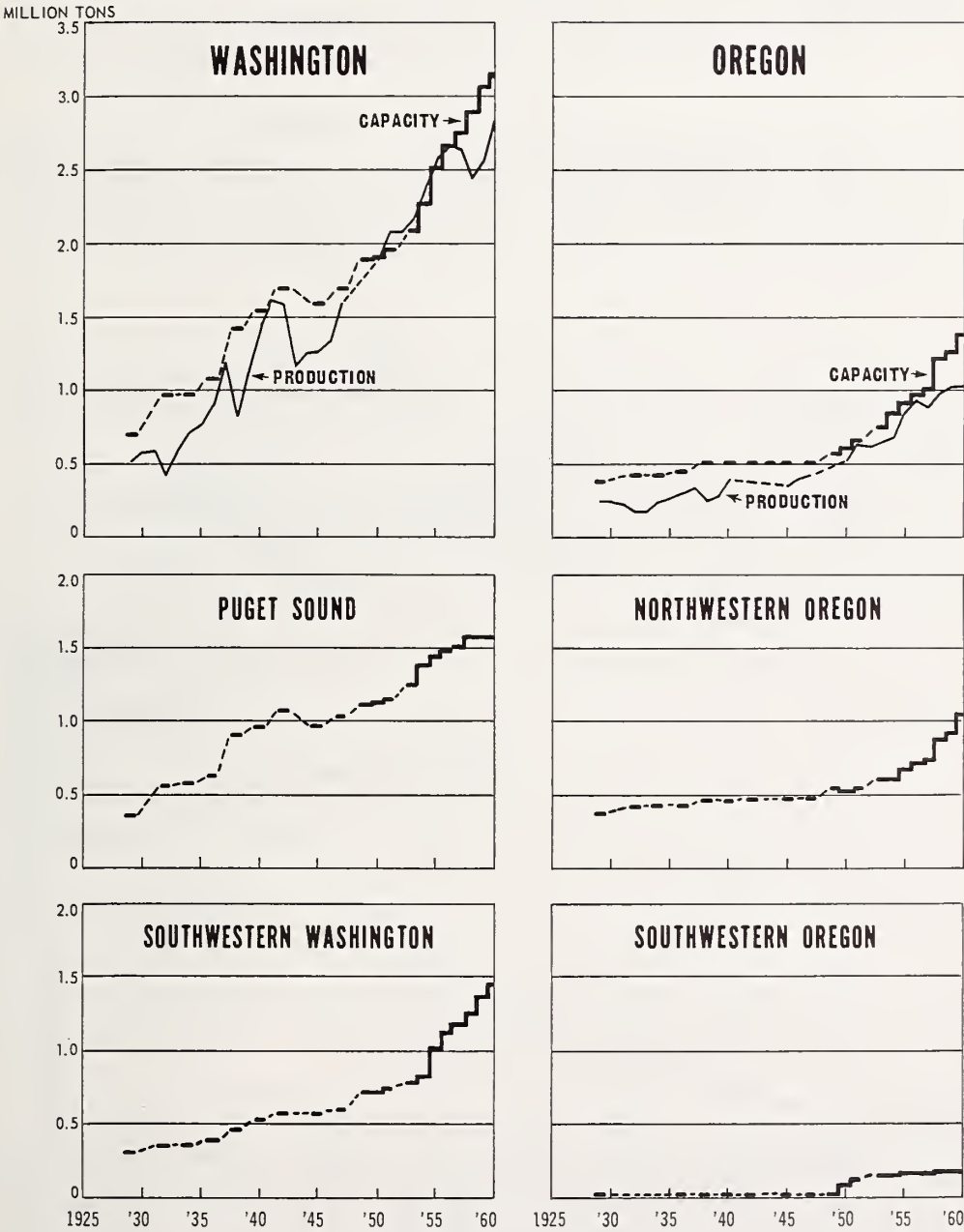


Figure 13.—Annual pulp capacity and production by State and subareas, 1930-60. (State totals include small amounts in eastern Washington and eastern Oregon.)

PULPWOOD CONSUMPTION

MILLION CORDS

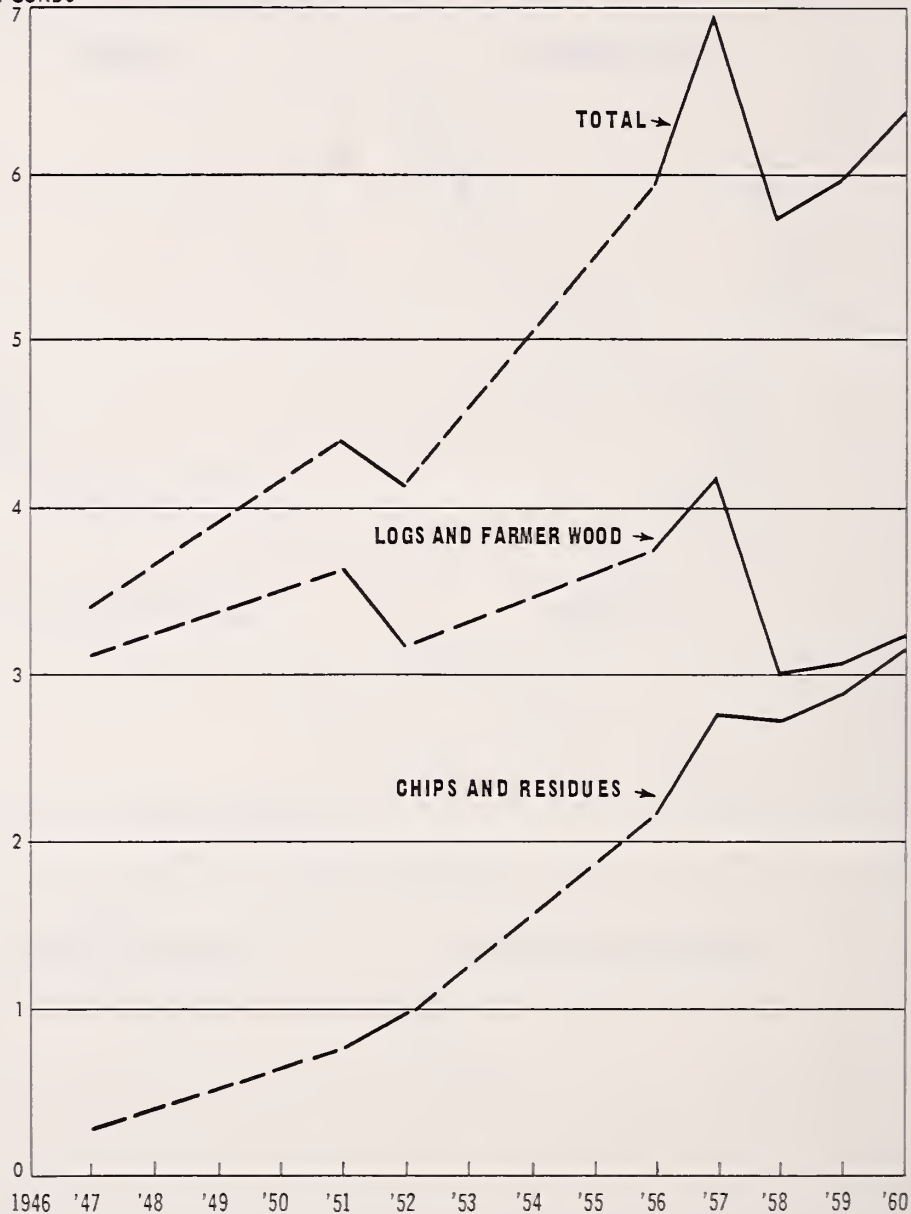


Figure 14.—Pulpwood consumption in Washington and Oregon, 1947-60.

Center of Pulp Capacity Shifting Southward From Puget Sound

From 1938 to 1951, 74 percent of the pulp capacity of Washington and Oregon was consistently located in western Washington with the heaviest concentration, 46 percent of the total, in the Puget Sound subarea.

Since 1951, the center of concentration of pulp capacity has shifted southward (fig. 13, table 11). In 1960, western Washington's pulp capacity had declined to 67 percent of the total. Western Oregon's share increased correspondingly from 24 percent in the 1940's to 27 percent in 1960. In

Table 13. — Pulpwood consumption in Washington and Oregon, 1929-60

Year	Washington			Oregon			Oregon and Washington		
	Logs and farmer wood	Chips and residue	Total	Logs and farmer wood	Chips and residue	Total	Logs and farmer wood	Chips and residue	Total
Thousand cords									
1929 ¹	--	--	--	--	--	--	750	500	1,250
1930 ²	568	--	--	395	--	--	963	--	--
1931	--	--	--	--	--	--	--	--	--
1932	--	--	--	--	--	--	--	--	--
1933	--	--	--	--	--	--	--	--	--
1934	--	--	--	--	--	--	--	--	--
1935	--	--	--	--	--	--	--	--	--
1936 ¹	--	--	--	--	--	--	1,780	220	2,000
1937	--	--	--	--	--	--	--	--	--
1938	--	--	--	--	--	--	--	--	--
1939	--	--	--	--	--	--	--	--	--
1940	--	--	--	--	--	--	--	--	--
1941	--	--	--	--	--	--	--	--	--
1942	--	--	--	--	--	--	--	--	--
1943	--	--	--	--	--	--	--	--	--
1944 ³	2,329	--	--	1,189	--	--	3,518	--	--
1945	--	--	--	--	--	--	--	--	--
1946	--	--	--	--	--	--	--	--	--
1947 ⁴	2,592	254	2,846	530	36	566	3,122	290	3,412
1948	--	--	--	--	--	--	--	--	--
1949	--	--	--	--	--	--	--	--	--
1950	--	--	--	--	--	--	--	--	--
1951 ⁴	2,892	705	3,597	733	76	809	3,625	781	4,406
1952 ⁵	2,215	594	2,809	959	375	1,334	3,174	969	4,143
1953	--	--	--	--	--	--	--	--	--
1954	--	--	--	--	--	--	--	--	--
1955	--	--	--	--	--	--	--	--	--
1956 ⁴	3,011	1,736	4,747	745	429	1,174	3,756	2,165	5,921
1957 ⁴	3,563	2,177	5,740	634	568	1,202	4,197	2,745	6,942
1958 ⁴	2,465	1,932	4,397	554	785	1,339	3,019	2,717	5,736
1959 ⁴	2,496	2,031	4,527	576	846	1,422	3,072	2,877	5,949
1960 ⁴	2,616	2,205	4,821	616	928	1,544	3,232	3,133	6,365

¹ Figures for 1929 and 1936 are for pulpwood consumption. Source: Andrews, H. J., and Cowlin, R. W. Forest resources of the Douglas-fir region. U. S. Dept. Agr. Misc. Pub. 389, 169 pp., illus. 1940.

² Figures for 1930 are for production of forest pulpwood. Source: Same as footnote 1.

³ Figures are for timber cut from commercial forests for pulpwood in 1944. Source: Unpublished data on file Pacific Northwest Forest & Range Experiment Station.

⁴ Source for 1947, 1951, 1956, 1957, 1958, 1959, and 1960: Economic survey. Northwest Pulp & Paper Association, Tacoma, Wash.

⁵ Source for 1952: Gedney, D. R. Annual cut and timber products output in the Pacific Northwest in 1952. U. S. Forest Serv. Pac. NW. Forest & Range Exp. Sta. Forest Survey Rpt. 126, 29 pp., illus. 1956. Based on conversion of 85 cubic feet per cord.

the same period, pulp capacity in eastern Washington and eastern Oregon increased from 2 percent to 6 percent of the total, with the greater increase in eastern Oregon.

Postwar Expansion of Pulp Capacity Based on Chips

Almost all of the expansion in pulpwood consumption in Washington and Oregon after 1947 was based on chips and residues from the lumber and plywood industries. Prior to 1947, residues provided about 10 percent of the total pulpwood requirements. By 1957, however, residue used for pulp totaled 2.7 million cords, or 40 percent of the pulpwood consumed, and in 1960, 49 percent (fig. 14, table 13).

Roundwood consumption increased from 3.1 million cords in 1947 to 4.2 million cords in 1957. Since 1957, roundwood consumption has averaged about 3.1 million cords, or 51 percent of the total consumption of 6.0 million cords.

In Oregon, 60 percent of the pulpwood consumption in 1960 was in the form of chips and residues; in Washington, the percentage was 46 percent (table 14).

Table 14. — Proportion of chips and mill residues in total pulpwood consumption, 1929-60

Year	Washington	Oregon	Total
	Percent		
1929	--	--	40
1936	--	--	11
1947	9	6	8
1951	20	9	18
1952	21	28	23
1956	39	37	37
1957	38	47	40
1958	44	59	47
1959	45	59	48
1960	46	60	49

Sulfate Process Now Exceeds Sulfite Capacity

From 1936 to 1947, the sulfite process constituted about 54 percent of the pulp capacity in Washington and Oregon. The groundwood process constituted 23 percent and sulfate, 20 percent.

In the expansion from 1947 to 1960, sulfate capacity increased 1.3 million tons, making up 57 percent of the expansion. Sulfite increased 0.6 million tons and other processes, 0.4 million tons. In 1960, sulfate made up 40 percent of the annual capacity; sulfite, 38 percent.

Table 15 shows the distribution of capacity by process in Washington and Oregon. The sulfite process still dominates the pulp industry in Washington, where it constitutes 46 percent of the pulp capacity. In Oregon, the sulfate process constitutes 41 percent of the total capacity, with the balance divided more or less equally among other major process categories.

Table 15. — Distribution of annual pulp capacity by process in Washington and Oregon, 1960

Area	Pulp Process			
	Sulfite	Sulfate	Groundwood	Other
----- Thousand tons -----				
Puget Sound	880	429	258	17
Southwestern Washington	560	735	66	88
Eastern Washington	15	70	35	--
Total Washington	1,455	1,234	359	105
Northwestern Oregon	245	429	250	116
Southwestern Oregon	32	140	--	17
Eastern Oregon	--	--	--	161
Total Oregon	277	569	250	294
Total	1,732	1,803	609	399

Hemlock Roundwood and Douglas-fir Chips Principal Pulpwood Sources

Only limited data are readily available on the species composition of pulpwood consumption. However, in 1956, hemlock was the principal species of roundwood used in Washington, constituting 44.4 percent of total consumption of all pulpwood in that year (table 16). Douglas-fir chips and residues were next in importance, accounting for 21.8 percent of the total.

Table 16. — Species composition of pulpwood consumption in Washington, 1956

Species	Chips and mill residues	Logs and farmer wood	Total
----- Percent -----			
Hemlock	8.3	44.4	52.7
Douglas-fir	21.8	6.8	28.6
True fir	1.5	6.1	7.6
Alder	(1)	3.1	3.1
Cottonwood	.1	2.3	2.4
Spruce	.2	1.9	2.1
Cedar	1.5	(1)	1.5
Other species	.5	1.5	2.0
Total	33.9	66.1	100.0

¹ Less than 0.1 percent.
Source: Erickson, Dr. Harvey D. Wood supply and production of the pulp industry in the State of Washington. Wash. State Inst. Forest Prod. New Wood Use Ser. Cir. 32, 39 pp., illus. 1957.

For the Pacific Northwest as a whole, it is estimated that hemlock roundwood constitutes about 35 percent of total pulpwood consumption and Douglas-fir chips and residues, about 30 percent.

Pulpwood Requirements Only 16 Percent Of Total Log Production

Total log consumption for pulpwood has remained relatively stable in the postwar period, averaging about 1.7 billion board feet, log scale,¹⁰ per year, or 16 percent of the total log output of the Douglas-fir subregion.

In western Oregon, log consumption for pulpwood has averaged about 5 percent of total log output. In western Washington, log consumption for pulpwood has varied between 30 and 40 percent of total log output with most of the demand being for hemlock.

In the case of hemlock and true fir pulp logs, there has been some competition between the pulp industry and the lumber and plywood industries for logs but little competition for Douglas-fir logs and other species. Both sawmills and veneer mills have increased their use of hemlock logs since World War II. In western Washington, for example, hemlock lumber output nearly doubled between 1945 and 1960, increasing from 17 percent to 38 percent of the total lumber produced.

Except for the competition for hemlock logs, the pulp industry has had a favorable influence on both the lumber and the plywood industry through its program for utilizing chips from mill residues. In many instances, the pulp industry has provided the initiative and financial arrangements for installing chipping facilities at sawmills. The market for pulp chips has tended to favor the larger mills having a daily capacity of 80,000 board feet or more. As log prices have risen in the postwar period, moreover, the pulp industry has tended to divert its better grade logs to lumber and plywood use, particularly hemlock, and substitute lower grade logs in fulfilling its annual log requirements.

Unused Pulping Capacity About 450 Million Board Feet, Log Scale, in 1960

In 1960, pulp capacity in terms of pulpwood input was 7.3 million cords, based on consumption of 1.6 cords of pulpwood per ton of pulp production. Actual consumption was 6.4 million cords. Unused capacity, accordingly, was 0.9 million cords or 450 million board feet, log scale.

¹⁰ Based on consumption of 1.6 cords of pulpwood per ton of pulp production.

Total Log Production in the Subregion

Annual Log Production at Highest Level in Subregion, 1948-60

In the Douglas-fir subregion, annual log production¹¹ reached a historical peak of 12.2 billion board feet in 1952, about 13 percent above the average of 10.9 billion board feet in the period 1947-60 as shown in table 17.

Table 17. — Average annual log production in the Douglas-fir subregion for periods since 1904

Period	Production
Million board feet, Scribner log scale	
1904-09	4,262
1910-19	5,431
1920-29	8,356
1930-35	5,038
1936-46	8,297
1947-60	10,862

After 1952, log production declined more or less steadily to 10.8 billion board feet in 1960, the average level for the postwar period (fig. 15, table 18).

Center of Log Production Shifts to Southwestern Oregon

Western Oregon's log production expanded from an average annual output of 2.3 billion board feet in the 1930's to 8.7 billion feet in 1952. It exceeded western Washington's output for the first time in 1941 when its production reached 5.3 billion feet. Log production was centered in northwestern Oregon until 1945 and thereafter in southwestern Oregon (fig. 16, table 18).

¹¹ Includes volume removed as logs but not volume removed for poles, piling, and wood-cutting operations. Includes volume from live and dead trees.

LOG PRODUCTION

BILLION BOARD FEET, SCRIBNER LOG SCALE

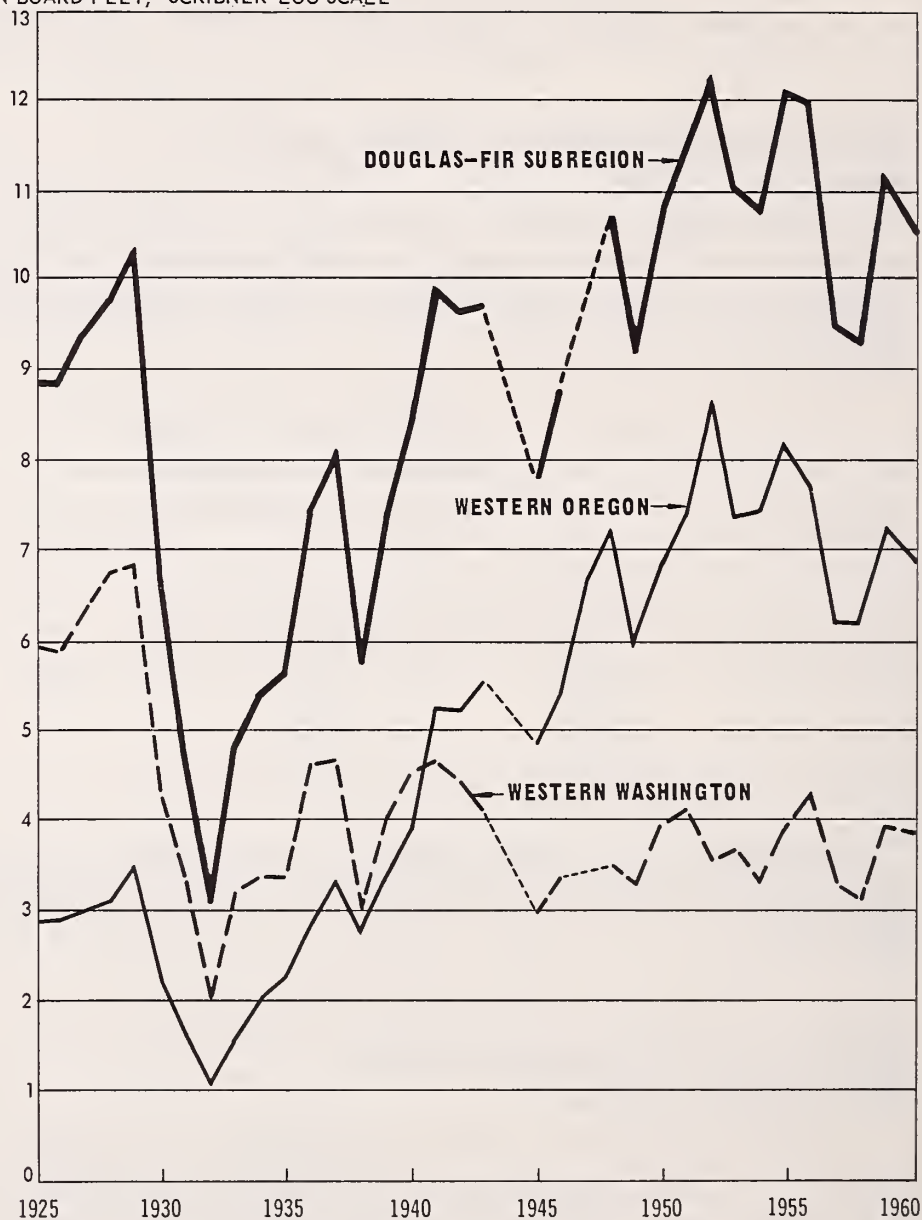


Figure 15.—Annual log production in the Douglas-fir subregion, 1925-60.

After 1952, Oregon's log output declined steadily to 6.9 billion board feet in 1960 (fig. 15), and was about equally divided between northwestern and southwestern Oregon (fig. 16, table 18). This downward trend accounted for most of the subregion's decline in log production since the early 1950's, for western Washington's log output showed no trend in the postwar period. It averaged 3.7 billion board feet from 1948 to 1960 with an average deviation of 8 percent or 306 million board feet. The pattern was about the same in the Puget Sound and southeastern Washington subareas.

Private Log Production Declines 2.5 Billion Feet After 1952

In the postwar period, log production from private lands in the Douglas-fir subregion increased rapidly to 9.4 billion board feet in 1952 (fig. 17, table 19). Thereafter, it declined more or less consistently to 6.9 billion board feet in 1960. Practically all the decline after 1952 was in western Oregon where it amounted to 2.4 billion board feet. In western Washington the change between 1952 and 1960 was less than 100 million board feet.

Table 18.—Log production in the Douglas-fir subregion by subareas, 1925-60

Year	Washington			Oregon			Douglas-fir subregion
	Puget Sound	South-western	State	North-western	South-western	State	
— — — — — Million board feet, Scribner log scale — — — — —							
1925	3,622	2,344	5,966	2,159	716	2,875	8,841
1926	3,373	2,548	5,921	2,147	761	2,908	8,829
1927	3,743	2,631	6,374	2,205	794	2,999	9,373
1928	4,145	2,532	6,677	2,307	793	3,100	9,777
1929	4,051	2,778	6,829	2,427	1,038	3,465	10,294
1930	2,585	1,755	4,340	1,616	592	2,208	6,548
1931	1,918	1,313	3,231	1,197	384	1,581	4,812
1932	1,077	965	2,042	803	267	1,070	3,112
1933	1,779	1,415	3,194	1,146	429	1,575	4,769
1934	1,989	1,387	3,376	1,261	744	2,005	5,381
1935	2,148	1,204	3,352	1,517	738	2,255	5,607
1936	2,953	1,667	4,620	1,901	962	2,863	7,483
1937	3,059	1,602	4,661	2,051	1,324	3,375	8,036
1938	2,049	988	3,037	1,787	965	2,752	5,789
1939	2,771	1,254	4,025	2,046	1,303	3,349	7,374
1940	3,177	1,343	4,520	2,418	1,462	3,880	8,400
1941	3,298	1,351	4,649	3,188	2,078	5,266	9,915
1942	3,231	1,188	4,419	3,134	2,103	5,237	9,656
1943	2,854	1,301	4,155	3,134	2,421	5,555	9,710
1944	—	—	—	—	—	—	—
1945	2,012	967	2,979	2,488	2,345	4,833	7,812
1946	2,117	1,246	3,363	2,674	2,760	5,434	8,797
1947	—	—	—	3,345	3,289	6,634	—
1948	2,184	1,330	3,514	3,328	3,876	7,204	10,718
1949	2,095	1,213	3,308	2,832	3,121	5,953	9,261
1950	2,471	1,482	3,953	2,863	3,943	6,806	10,759
1951	2,572	1,555	4,127	2,801	4,612	7,413	11,540
1952	2,363	1,220	3,583	3,235	5,430	8,665	12,248
1953	2,251	1,439	3,690	2,806	4,537	7,343	11,033
1954	2,067	1,248	3,315	2,630	4,808	7,438	10,753
1955	2,351	1,541	3,892	2,895	5,308	8,203	12,095
1956	2,474	1,794	4,268	3,073	4,640	7,713	11,981
1957	1,978	1,319	3,297	2,366	3,831	6,197	9,494
1958	1,809	1,299	3,108	2,182	4,028	6,210	9,318
1959	2,453	1,513	3,966	2,559	4,660	7,219	11,185
1960	2,332	1,557	3,889	2,322	4,607	6,929	10,818

LOG PRODUCTION by SUBAREAS

BILLION BOARD FEET, SCRIBNER LOG SCALE

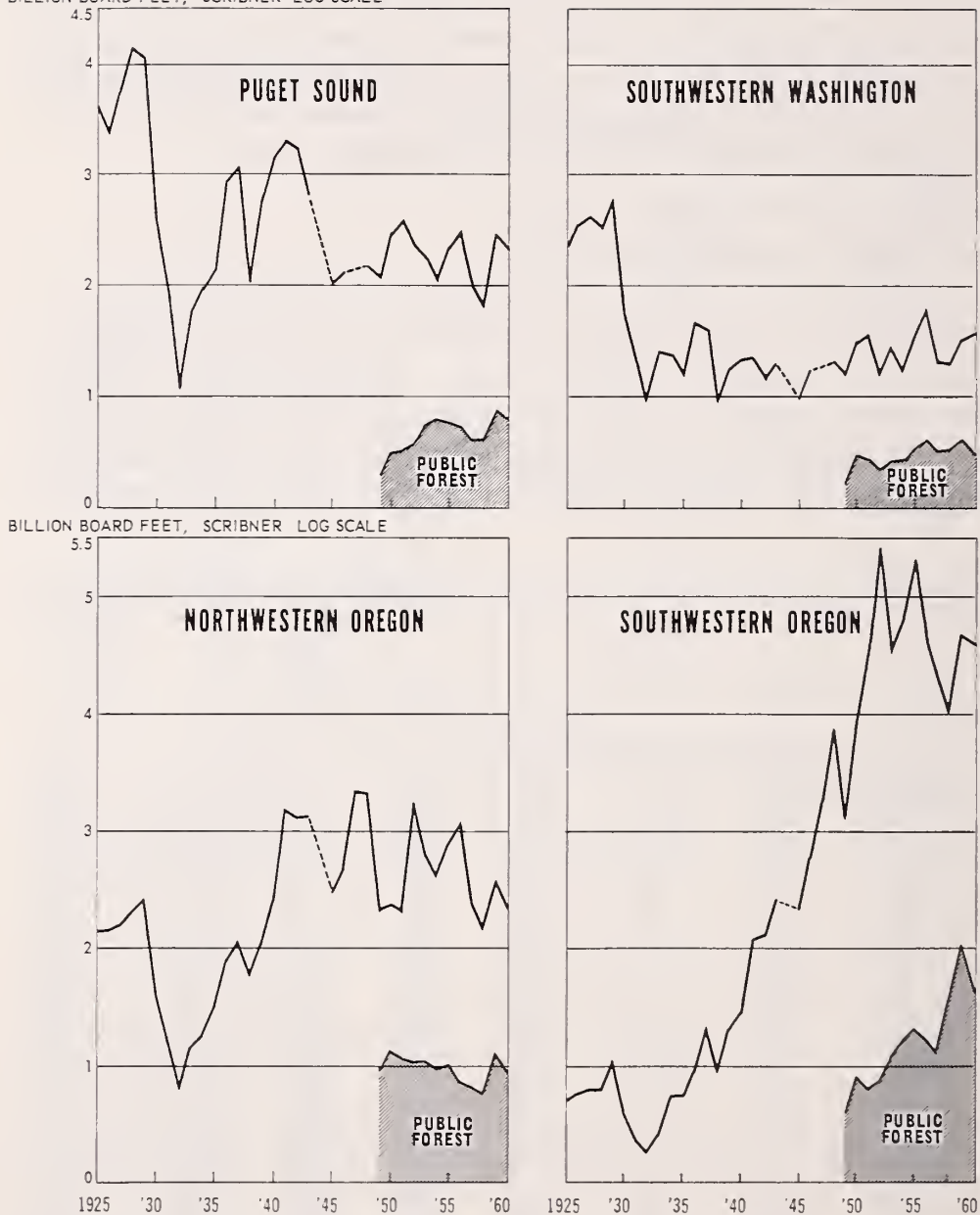


Figure 16.—Annual log production for subareas of the Douglas-fir subregion, 1925-60. Production from public forests shown in shaded segment for 1949-60.

Log Production From Public Lands Expands 1 Billion Feet After 1952

The annual log harvest from public lands in the subregion reached a level of 1 billion board feet about 1940. By 1949, it had doubled to 2 billion board feet, constituting somewhat more than 20 percent of the total log output in the subregion. About a third of this public harvest in the late 1940's, however, was salvage from State and county lands in the Tillamook Burn.

In 1952, when private log production peaked at 9.4 billion feet, the log harvest from public lands was 2.8 billion board feet, 23.2 percent of the total cut. In 1959, the harvest of public timber reached a peak of 4.6 billion feet, or more than 41 percent of the total cut.

Increase in Harvest From Public Lands Greatest in Southwestern Oregon

In western Washington, log production from public lands increased uniformly in the postwar period and tended to offset more or less completely the decline in log output from private lands between 1950 and 1960 (fig. 17, table 19). Table 20 brings out the increasing relative importance of the public harvest between 1950 and 1960.

LOG PRODUCTION from PRIVATE and PUBLIC SOURCES

BILLION BOARD FEET, SCRIBNER LOG SCALE

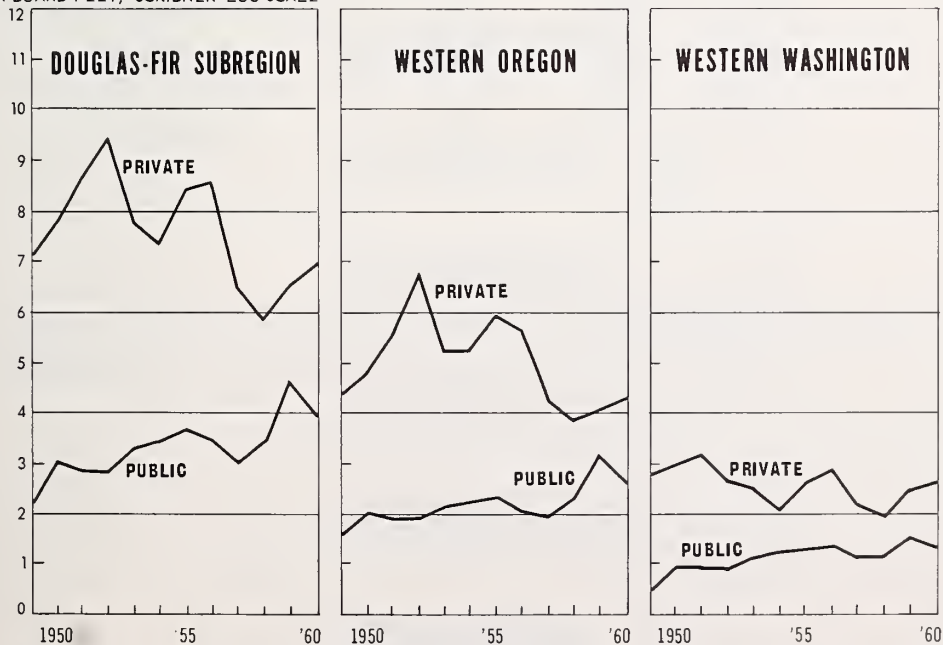


Figure 17.—Distribution of annual log production between public and private sources in the Douglas-fir subregion, 1949-60.

The harvest from public lands in western Oregon remained relatively stable from 1950 to 1957, averaging 2.1 billion feet. This was largely due to decline in the salvage harvest on State and county lands on the Tillamook Burn in northwestern Oregon as the harvest from other public lands increased. From 1958 to 1960, the average annual cut on public lands increased to 2.7 billion feet, approximately 38 percent of the total log harvest in western Oregon.

The greatest increase in public log harvest came in southwestern Oregon. From the 1950-52 average of 869 million board feet, it increased to 1,742 million feet in the years of 1958-60. This increase of 873 million board feet was nearly double the increase in public harvest in all of western Washington. In northwestern Oregon, the public harvest has consistently averaged a billion board feet per year.

Table 20. — Percent of total log production from public lands, 1950-60

Area	1950-52	1953-56	1957-60
Western Washington	24.7	33.3	35.4
Puget Sound	21.6	33.4	33.9
Southwestern Washington	30.1	34.1	37.7
Western Oregon	25.6	28.5	37.7
Northwestern Oregon	36.4	34.5	37.9
Southwestern Oregon	18.6	25.2	37.5
Douglas-fir subregion	25.3	30.1	36.9

Tables 21 and 22 show the distribution of the public harvest by public ownership class and subareas.

Table 21.—Log production in western Washington by ownership class and subareas, 1949-60

Subarea and year	Forest Service	State forests ¹	Other public ²	All Public	Private and other	Total	Forest Service	State forests and other public	All public
— — — — — Million board feet, Scribner log scale — — — — — Percent — — — — —									
Puget Sound:									
1949	232	11	38	281	1,814	2,095	11.1	2.3	13.4
1950	333	126	38	497	1,973	2,470	13.5	6.6	20.1
1951	382	111	37	530	2,041	2,571	14.9	5.8	20.6
1952	412	121	37	570	1,793	2,363	17.4	6.7	24.1
1953	524	187	39	750	1,501	2,251	23.3	10.0	33.3
1954	487	289	27	803	1,264	2,067	23.6	15.3	38.8
1955	450	257	53	760	1,591	2,351	19.1	13.2	32.3
1956	436	297	11	744	1,729	2,473	17.6	12.5	30.1
1957	432	166	13	611	1,367	1,978	21.8	9.1	30.9
1958	505	99	15	619	1,189	1,808	27.9	6.3	34.2
1959	716	164	2	882	1,571	2,453	29.2	6.8	36.0
1960	605	166	23	794	1,538	2,332	25.9	8.1	34.0
Southwestern Washington:									
1949	190	8	45	243	969	1,212	15.7	4.4	20.0
1950	235	193	51	479	1,003	1,482	15.9	16.5	32.3
1951	245	132	68	445	1,110	1,555	15.8	12.9	28.6
1952	227	41	89	357	863	1,220	18.6	10.7	29.3
1953	217	112	98	427	1,012	1,439	15.1	14.6	29.7
1954	242	81	99	422	825	1,247	19.4	14.4	33.8
1955	239	153	144	536	1,006	1,542	15.5	19.3	34.8
1956	291	198	115	604	1,190	1,794	16.2	17.4	33.7
1957	240	207	66	513	806	1,319	18.2	20.7	38.9
1958	271	187	70	528	771	1,299	20.9	19.8	40.6
1959	392	103	117	612	901	1,513	25.9	14.5	40.4
1960	304	88	100	492	1,065	1,557	19.5	12.1	31.6

¹ Years 1949-54 based on timber sold.² Indian lands, National Parks, Bureau of Land Management.

Source: Log production reports for the years 1949-60, published by Pacific Northwest Forest and Range Experiment Station.

Table 22. — Log production in western Oregon by ownership class and subareas, 1949-60

Subarea and year	Forest Service	Bureau of Land Mangt. ¹	State forests ²	Other public	All public	Private	Total	Forest Service	Bureau of Land Mangt.	State forests and other public	All public
— — — — — Million board feet, Scribner log scale — — — — — Percent — — — — —											
Northwestern Oregon:											
1949	178	41	761	14	994	1,839	2,833	6.3	1.4	27.4	35.1
1950	214	77	816	29	1,136	1,726	2,862	7.5	2.7	29.5	39.7
1951	244	91	714	19	1,068	1,734	2,802	8.7	3.2	26.2	28.1
1952	310	104	606	14	1,034	2,202	3,236	9.6	3.2	19.2	32.0
1953	400	99	531	1	1,031	1,775	2,806	14.3	3.5	18.9	36.7
1954	379	144	467	1	991	1,639	2,630	14.4	5.5	17.8	37.7
1955	413	155	440	—	1,008	1,887	2,895	14.3	5.3	15.2	34.8
1956	409	109	350	—	868	2,205	3,073	13.3	3.5	11.4	28.2
1957	373	157	291	—	821	1,546	2,367	15.8	6.6	12.3	34.7
1958	509	153	103	—	765	1,417	2,182	23.3	7.0	4.7	35.0
1959	768	228	111	—	1,107	1,453	2,560	30.0	8.9	4.3	43.2
1960	614	192	138	—	944	1,379	2,323	26.4	8.3	5.9	40.6
Southwestern Oregon:											
1949	346	222	22	12	602	2,519	3,121	11.1	7.1	.1	19.3
1950	554	326	14	9	903	3,041	3,944	14.0	8.3	.6	22.9
1951	558	256	10	—	824	3,788	4,612	12.1	5.6	.2	17.9
1952	597	282	2	—	881	4,548	5,429	11.0	5.2	—	16.2
1953	637	442	3	—	1,082	3,455	4,537	14.0	9.7	.1	23.8
1954	790	428	5	—	1,223	3,585	4,808	16.4	8.9	.1	25.4
1955	800	529	3	—	1,332	3,975	5,307	15.1	10.0	—	25.1
1956	804	410	4	—	1,218	3,422	4,640	17.3	8.8	.1	26.2
1957	699	414	11	—	1,124	2,707	3,831	18.2	10.8	.3	29.3
1958	963	570	13	—	1,546	2,483	4,029	23.9	14.1	.3	38.4
1959	1,301	704	25	—	2,030	2,629	4,659	27.9	15.1	.5	43.6
1960	996	622	33	—	1,651	2,956	4,607	21.6	13.5	.7	35.8

¹ Data for 1949-55 from Bureau of Land Management.

² Data for 1949-57 from estimates provided by Office of State Forester, Salem, Oregon.

Source: Log production reports for the years 1949-60, published by Pacific Northwest Forest and Range Experiment Station.

Relationship of Log Production to Total Forest Industry Capacity, 1945-60

Some of the highlights of relationships between log production and forest industry capacity have been introduced in the preceding discussions of the lumber, plywood, and pulp industries. Here, the relationships between log production and industrial capacity during the postwar period are brought together and generalized for the lumber, plywood, and pulp industries collectively.

Because log consumption in the pulp industry remained essentially constant during the postwar expansion of pulp capacity, it is easiest handled analytically by subtracting pulp log consumption from total log production. Accordingly, log production figures in table 18 are reduced to a saw log and peeler log production basis by subtracting log and farmer wood consumption for pulp as reported as in table 13. The subtraction is made at the rate of 500 board feet of log production per cord of pulpwood. Oregon pulp log consumption is attributed entirely to northwestern Oregon. For the years that pulp log consumption is lacking, the average of reported years is used as the best estimate. For convenience in exposition, the term "log production," as used in this section, includes saw log and peeler log production only.

Subregion's Log Production Consistently Below Lumber and Plywood Capacity

Since 1946, annual log production in the Douglas-fir subregion has been consistently below the installed annual log input capacity of the lumber and plywood industries (fig. 18, table 23). The excess of lumber and plywood capacity over log production was greatest in the recession years: 1949, 1953-54, 1957-58, and 1960. In these years, it averaged 2.3 billion board feet, log scale, or 21.6 percent of the installed capacity. Most of the excess in these years was attributable to cyclical declines in lumber production.

In the most favorable years, the excess averaged 1.0 billion board feet, log scale, only 43 percent as much as that in the recession years.

Table 23. — Relation of log production to lumber and plywood log input capacity in the Douglas-fir subregion, 1945-60

Year	Lumber and plywood capacity	Plywood and sawmill log production	Capacity in excess of log production	
			Amount	Proportion of capacity
	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	Percent
1945		5,980		
1946	8,113	7,111	1,002	12.4
1947	9,202			
1948	9,708	9,032	676	7.0
1949	9,833	7,575	2,258	23.0
1950	10,266	9,073	1,193	11.6
1951	11,122	9,728	1,394	12.5
1952	11,175	10,661	514	4.6
1953	10,767	9,347	1,420	13.2
1954	10,689	9,067	1,622	15.2
1955	11,480	10,409	1,071	9.3
1956	11,001	10,103	898	8.2
1957	10,842	7,395	3,447	31.8
1958	10,693	7,808	2,885	27.0
1959	10,976	9,650	1,326	12.1
1960	11,392	9,202	2,190	19.2

LOG INPUT CAPACITY and LOG PRODUCTION

BILLION BOARD FEET, SCRIBNER LOG SCALE

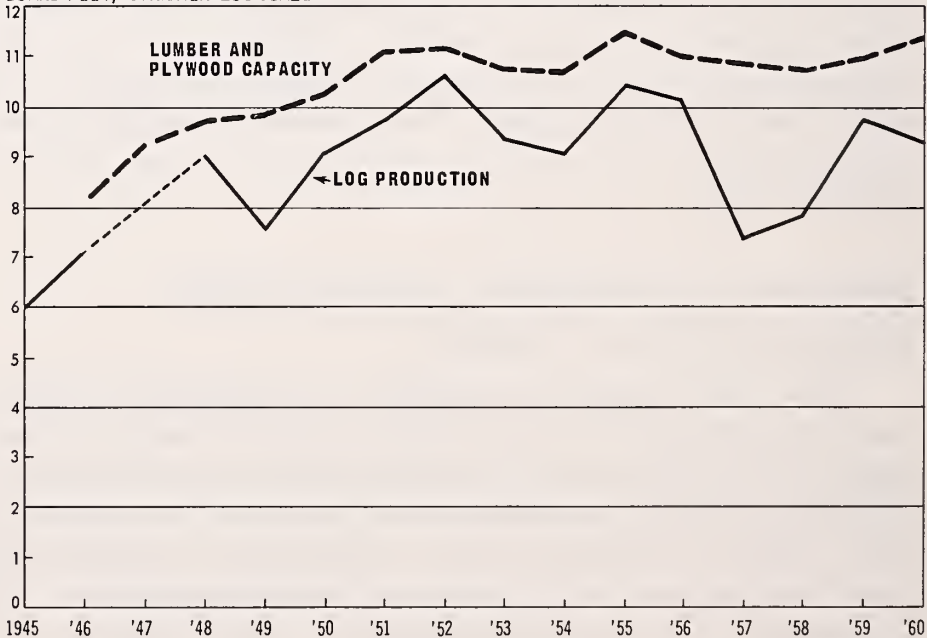


Figure 18.—Annual lumber and plywood log input capacity and saw log and peeler log production in the Douglas-fir subregion, 1945-60.

Log Production Increases More Than Industrial Capacity, 1946-52

From 1946 to 1952, log production in the subregion increased 3.6 billion board feet, log scale, 0.5 billion feet more than the expansion of lumber and plywood capacity as measured in log input units (table 23). Unused capacity in 1952, moreover, dropped to 0.5 billion board feet, log scale (table 23), the lowest level experienced by the lumber and plywood industries in the postwar period. Most of the industrial expansion in this period came in lumber production, largely in response to the rapid rise in lumber demand after the war.

Expansion of Capacity Stops in Subregion and Log Production Declines

Expansion of the combined lumber and plywood capacity stopped abruptly in 1952 and remained practically stable at 11 billion board feet, log scale, thereafter. In this period of stable capacity, however, plywood capacity continued to expand while lumber capacity declined in nearly equal amount. This leveling off of lumber and plywood capacity appears to have been largely a response to the log supply situation in the Douglas-fir subregion. Log production declined more or less steadily after 1952.

Stumpage Price Rise After 1952 Fails to Halt Log Production Decline

Rising stumpage prices to 1956 and their relatively high level to 1960 (fig. 19) failed to halt the decline in log production after 1952. The stumpage price increase from 1947 to 1952 was largely associated with increased demand for logs to meet the requirements of the expanding forest products industry in that period. The increase in stumpage prices after 1952, however, is associated with an increase in the proportions and absolute amount of the subregion's log production consumed in the plywood industry.

Western Washington's Capacity Fails to Increase in Early Postwar Years

While lumber and plywood capacity in the subregion expanded in the postwar years to 1952, it remained relatively stable in western Washington, averaging 3.7 billion board feet, log scale, with an average deviation of only 2.2 percent (fig. 20). In this period, western Washington plants were partially dependent upon log imports from other areas, largely western Oregon, where log production exceeded installed capacity to 1952 (fig. 20). From 1946 to 1952, western Washington's installed capacity averaged 1.4 billion feet, log scale, more than its log production. Unused

DOUGLAS-FIR STUMPAGE PRICES

CONSTANT 1947-49 DOLLARS PER M Bd. Ft., SCRIBNER LOG SCALE

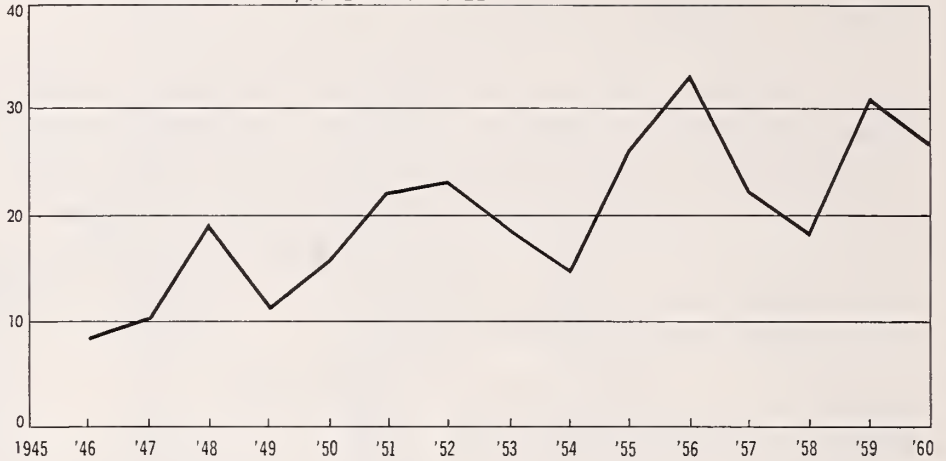


Figure 19.—Douglas-fir stumpage prices in the Douglas-fir subregion, 1946-60.

Source: Table 4 of "The Demand and Price Situation for Forest Products." U. S. Forest Serv. and Agr. Stabilization Conserv. Serv., 47 pp., illus. 1961.

lumber and plywood capacity, on the other hand, averaged only 0.8 billion feet log scale. After 1952, plant capacity in western Washington gradually declined, adjusting more closely to actual log production (fig. 20). This adjustment probably was in part a response to a tightening log supply situation in the 1950 decade in which western Oregon mills continued to expand capacity relative to log production.

Western Oregon's Log Production and Capacity Determine Subregion Trends

The general trends in log production and lumber and plywood capacity in the subregion in the postwar period were determined largely by developments in western Oregon (figs. 18 and 20 and table 24). Changes in log production and capacity in western Washington were relatively small by comparison.

From 1946 to 1955, the combined lumber and plywood capacity in western Oregon increased 3.5 billion board feet, log scale. Until 1952, the expansion was due, as for the subregion, almost entirely to the growth of the lumber industry. From 1952 to 1955, the net expansion was attributable entirely to the plywood industry; lumber capacity remained about the same in these years (fig. 11).

**RELATION of LOG PRODUCTION
to LUMBER and PLYWOOD CAPACITY**

BILLION BOARD FEET, SCRIBNER LOG SCALE

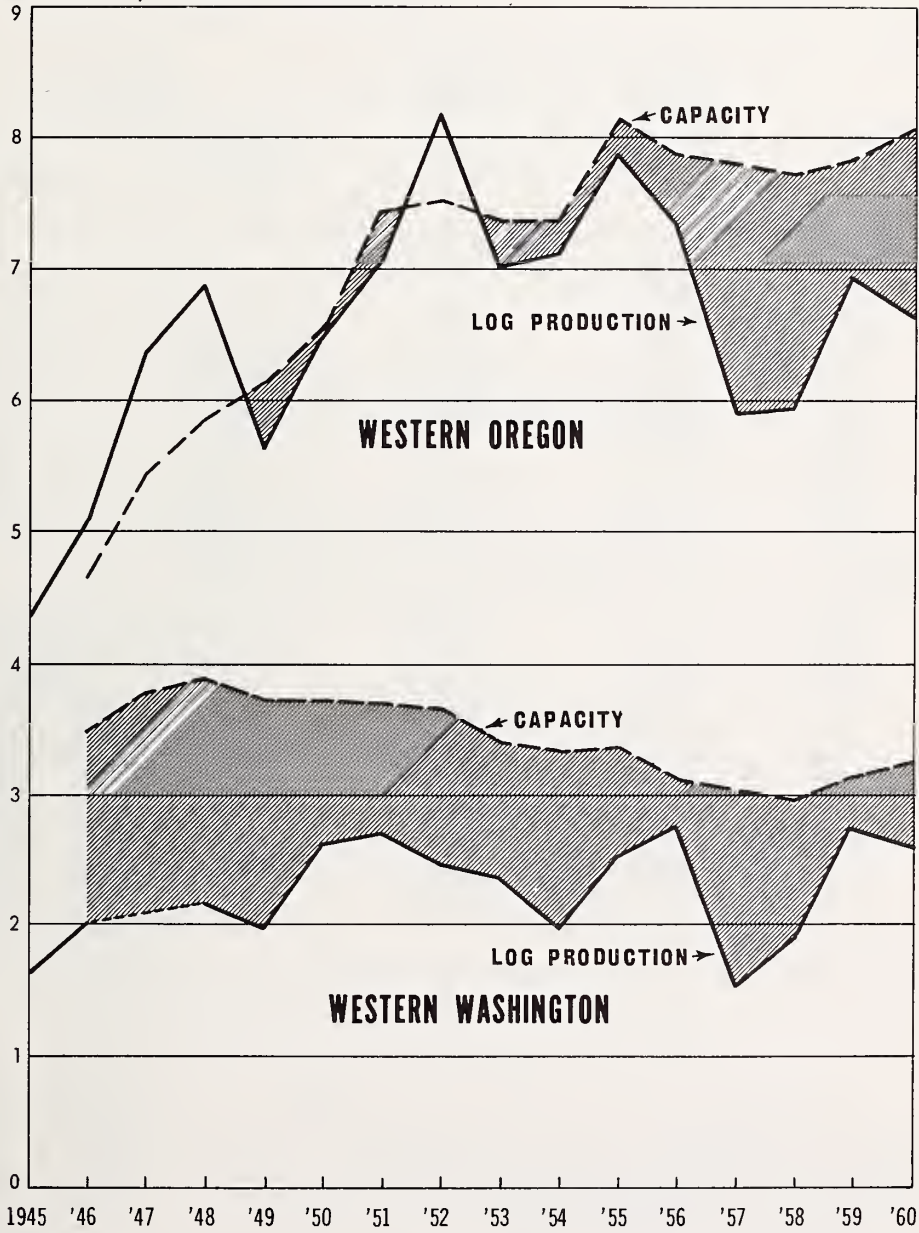


Figure 20.—Relation of log production to lumber and plywood capacity in western Washington and western Oregon, 1945-60.

Table 24. — Comparison of log production with lumber and plywood log input capacity in western Washington and western Oregon, 1945-60

Year	Lumber and plywood capacity	Plywood and sawmill log production	Capacity in excess of log production ¹	
	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	Percent
Western Washington:				
1945	--	1,631	--	--
1946	3,463	2,015	1,448	41.8
1947	3,789	--	--	--
1948	3,875	2,166	1,709	44.1
1949	3,704	1,960	1,744	47.1
1950	3,709	2,605	1,104	29.8
1951	3,680	2,681	999	27.1
1952	3,656	2,476	1,180	32.3
1953	3,401	2,342	1,059	31.1
1954	3,323	1,967	1,356	40.8
1955	3,357	2,544	813	24.2
1956	3,115	2,762	353	11.3
1957	3,033	1,515	1,518	50.0
1958	2,964	1,875	1,089	36.7
1959	3,135	2,718	417	13.3
1960	3,248	2,581	667	20.5
Western Oregon:				
1945	--	5,349	--	--
1946	4,650	5,096	(446)	(9.6)
1947	5,413	6,369	(956)	(17.7)
1948	5,833	6,866	(1,033)	(17.7)
1949	6,129	5,615	514	8.4
1950	6,557	6,468	89	1.4
1951	7,443	7,046	397	5.3
1952	7,519	8,185	(666)	(8.9)
1953	7,369	7,005	364	4.9
1954	7,366	7,100	266	3.6
1955	8,122	7,865	257	3.2
1956	7,885	7,341	544	6.9
1957	7,810	5,880	1,930	24.7
1958	7,729	5,933	1,796	23.2
1959	7,840	6,932	908	11.6
1960	8,055	6,621	1,434	17.8

¹Parentheses indicate excess of log production over lumber and plywood capacity.

As can be seen from figure 20 and table 25, capacity and log production expanded more or less together in western Oregon until 1952. Log production averaged 102 percent of capacity, exceeding or very nearly equaling it in individual years.

From 1955 to 1960, log production in western Oregon declined 1.2 billion board feet. In the same period, growth in capacity essentially ceased. Although lumber capacity declined, growth in plywood capacity tended to offset lumber capacity reductions (fig. 11).

Table 25. — Comparison of log production with lumber and plywood log input capacity in northwestern and southwestern Oregon, 1945-60

Year	Northwestern Oregon				Southwestern Oregon			
	Lumber and plywood capacity	Plywood and saw-mill log production	Capacity in excess of log production ¹		Lumber and plywood capacity	Plywood and saw-mill log production	Capacity in excess of log production ¹	
	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	Percent	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	MM bd. ft., Scribner log scale	Percent
1945								
1946	2,180	2,004	(120)	(5.5)	2,471	2,345	(289)	(11.7)
1947	2,415	2,300	(665)	(27.5)	2,996	2,760	(293)	(9.8)
1948	2,659	2,990	(331)	(12.4)	3,173	3,289	(703)	(22.2)
1949	2,806	2,494	312	11.1	3,323	3,121	202	6.1
1950	3,009	2,525	484	16.1	3,548	3,943	(395)	(11.1)
1951	3,315	2,434	881	26.6	4,128	4,612	(484)	(11.7)
1952	3,215	2,756	459	14.3	4,304	5,429	(1,125)	(26.1)
1953	3,231	2,468	763	23.6	4,138	4,537	(399)	(9.6)
1954	3,080	2,292	788	25.6	4,286	4,808	(522)	(12.2)
1955	3,256	2,557	699	21.5	4,866	5,308	(442)	(9.1)
1956	3,107	2,700	407	13.1	4,778	4,641	137	2.9
1957	3,131	2,049	1,082	34.5	4,679	3,831	848	18.1
1958	3,007	1,905	1,102	36.6	4,722	4,028	694	14.7
1959	3,220	2,272	948	29.4	4,620	4,660	(40)	(0.9)
1960	3,180	2,014	1,166	36.7	4,875	4,607	268	5.5

¹ Parentheses indicate excess of log production over lumber and plywood log input capacity.

RELATION of LOG PRODUCTION to LUMBER and PLYWOOD CAPACITY in OREGON

BILLION BOARD FEET, SCRIBNER LOG SCALE

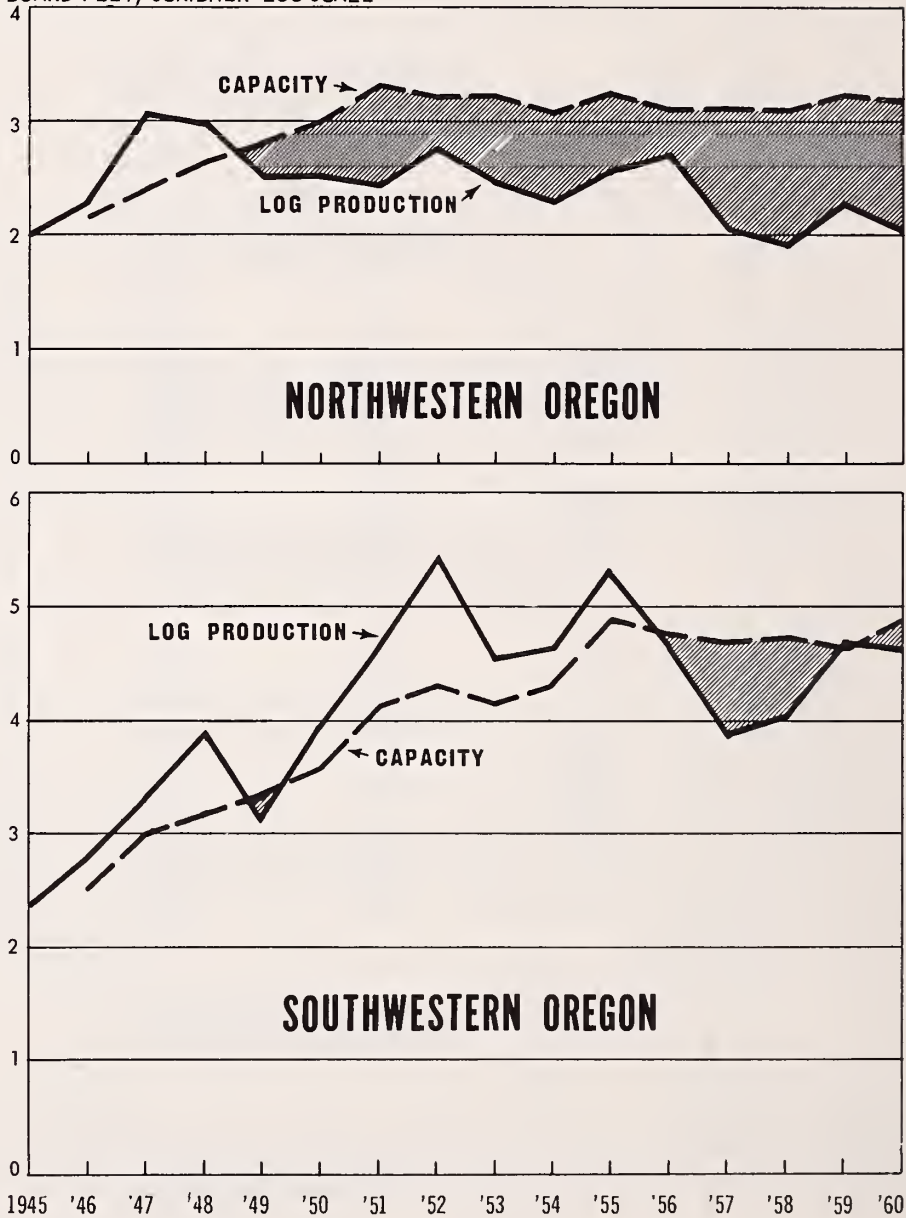


Figure 21.—Relation of log production to lumber and plywood capacity in northwestern and southwestern Oregon, 1945-60.

Log Production Declines and Capacity Expansion Halts After 1948 in Northwestern Oregon

In northwestern Oregon, annual log production exceeded lumber and plywood capacity to 1949 (fig. 21, table 25). When log production turned downward after 1948, expansion of capacity leveled off sharply beginning in 1951. Plywood capacity, however, continued to replace lumber capacity (fig. 11).

From 1951 to 1956, capacity exceeded log production by an average of 666 million board feet, log scale. In this period, it is probable that northwestern Oregon mills obtained part of their log requirements from southwestern Oregon, where annual log production averaged 445 million board feet more than installed capacity from 1946 to 1955 (fig. 21, table 25).

After 1956, unused capacity in northwestern Oregon increased to an average of 1,075 million board feet, log scale, or 34 percent of installed capacity. In southwestern Oregon, by contrast, it averaged only 443 million feet, or 9 percent.

Southwestern Oregon's Capacity Expansion Also Halts and Log Production Declines

While log production exceeded installed capacity in southwestern Oregon, capacity continued to expand. Log production fell after 1955 and expansion of capacity halted sharply, as they had in northwestern Oregon in 1951 (fig. 21, table 25). Elsewhere in the West, as stated before, lumber production continued to expand to 1959. Stumpage prices in the subregion were at their highest historical level.

Outlook for Log Production and Industrial Capacity After 1960

Log supplies in the next decade will be a critical factor in determining lumber and plywood capacity and production in the subregion. There is no important evidence which indicates that log supply will be a significant problem for the pulp industry in the 1960's even though capacity continues to expand.

Allowable Cut on Lands in Public Ownership Was 4.6 Billion Feet in 1960

For the Douglas-fir subregion the 1960 allowable cut on public lands was 4.6 billion board feet, plus a nonchargeable cut¹² of 0.3 billion feet. The distribution of the allowable cut, including the nonchargeable volume, is presented by subarea and public agency in table 26.

Table 26. — Distribution of allowable cut by subarea and public agency, 1960¹

Subarea	Forest Service	O&C lands	Public domain	Indian lands	State and other public lands	Total public
	— — — — —	— — — — —	Millian	board feet, Scribner lag	scale — — — — —	— — — — —
Puget Sound	725.3	--	--	21.2	396.4	1,142.9
Southwestern Washington	446.3	--	--	106.0	195.0	747.3
Western Washington	1,171.6	--	--	127.2	591.4	1,890.2
Northwestern Oregon	661.4	203.9	49.5	--	95.9	1,010.7
Southwestern Oregon	1,140.0	754.5	35.5	--	62.9	1,992.9
Western Oregon	1,801.4	958.4	85.0	--	158.8	3,003.6
Douglas-fir subregion	2,973.0	958.4	85.0	127.2	750.2	4,893.8

¹ Includes nonchargeable volume on basis of past experience. The volumes shown in this table are in terms of utilization standards and units of measure used in the industry today. They are not necessarily the same as those used in showing depletion of the forest inventory growing stock by these public agencies.

¹² For the Bureau of Land Management, the nonchargeable cut is estimated from their current experience, which is 11.6 percent of the current allowable cut. The Bureau expects this figure to increase to 14.3 percent by 1970. For all other public ownerships, the nonchargeable cut was estimated at 6 percent of their allowable cut, the average experience of National Forests in recent years.

Log Production from Public Lands Expected to Increase ¹³

In its longer range program for National Forests, the Forest Service in 1961 announced a harvest goal of 3.0 billion feet in Oregon and 1.6 billion feet in Washington for the year 1972.¹⁴ Prorating this increase in proportion to the 1960 allowable cuts for the east-side and west-side forests would indicate an allowable cut of 3.6 billion board feet by 1972 on National Forests in the Douglas-fir subregion. This is about 0.6 billion feet or 20 percent more than the 1960 allowable cut.

On October 15, 1962, the allowable cut on National Forests in the subregion was raised 258 million board feet, to 3.2 billion feet, or 9 percent above the 1960 allowable cut.

Similar increases on other public lands above the 1960 levels would indicate an allowable cut of 5.9 billion feet by 1972 for all public lands combined, or 1 billion feet more than in 1960.¹⁵ For the remainder of the 1960's the average allowable cut is estimated at 5.4 billion feet, a 10-percent increase over 1960, to permit gradual attainment of the increase estimated for 1972.

The allowable cut on public forest lands has shown a continuing upward trend to the present. From 1950 to 1960, for example, the increase in the Douglas-fir subregion was approximately 50 percent. This came largely as a result of improved inventories and growth data, closer utilization standards, and shorter rotations. Further increases in allowable cut to 1972 are expected to come in large measure from thinnings in young-growth and prelogging and salvage in old-growth timber.

Private Timber Harvest Expected to Decline in Subregion

Private log production in the Douglas-fir subregion is estimated at 6.7 billion feet for the 1960's. This corresponds to the following cutting rates for private lands:

<u>Subarea</u>	<u>Percent of inventory harvested</u>
Puget Sound	2.4
Southwestern Washington	2.8
Northwestern Oregon	2.8
Southwestern Oregon	4.0

¹³ Log production hereinafter includes pulp logs.

¹⁴ See pp. 29 and 38 of: U. S. Forest Service. A development program for the National Forests; estimates of work needed and costs by States. 42 pp. 1961.

¹⁵ On Bureau of Land Management lands in western Oregon, the allowable cut in 1962, including nonchargeable volume, was estimated at 1,258 million board feet, or 31 percent more than in 1960.

The projected cut of 6.7 billion feet constitutes a 1-billion-board-foot decline in private log production in the 1960's from the average for the 1950's, but about 5 percent more than the average for 1957 to 1960. It is about 55 percent of the total prospective harvest for the subregion, compared with 63 percent of the total cut in the subregion in the years 1957 to 1960 (table 20). Table 27 sets out the details of the public and private log harvest outlook by subareas for the 1960's.

Table 27. — Comparison of the prospective log harvest in the 1960's with the 1960 installed forest industry capacity

Area	Allowable cut on public lands, 1960's	Prospective private log harvest, 1960's	Total prospective log harvest, 1960's	Installed capacity 1960
— — — — — Billion board feet, Scribner log scale — — — — —				
Puget Sound	1.2	1.8	3.0	2.8
Southwestern Washington	.9	.9	1.8	1.8
Western Washington	2.1	2.7	4.8	4.6
Northwestern Oregon	1.1	1.7	2.8	2.5
Southwestern Oregon	2.2	2.3	4.5	4.9
Western Oregon	3.3	4.0	7.3	8.4
Subregion total	5.4	6.7	12.1	13.0

¹ Includes 1.4 billion board feet of logs for pulpmill consumption. This is divided equally between Puget Sound and southwestern Washington since pulp capacity is distributed about equally between these subregions.
² Includes 0.3 billion feet of logs for pulpmills.

Subregion's Prospective Log Harvest About 1 Billion Feet More Than Average Cut in 1959 and 1960

The average annual prospective log harvest for the 1960's is estimated at 12.1 billion board feet for the Douglas-fir subregion. It is 1.1 billion feet more than the average cut of 11.0 billion feet for 1959 and 1960.

Almost all, 0.9 billion feet, of the projected additional cut is in western Washington. About 0.5 billion feet arises from the deficit between the actual cut and the allowable cut on all public lands in 1959 and 1960 (table 28). An additional 0.2 billion feet is attributable to the projected increase in allowable cut on public lands during the 1960's. The balance is due to a net increase in the private timber harvest. This arises from a favorable relation of growth rates to cutting rates and an assumed increase in intensity of management and utilization of second-growth timber.

The 0.2 billion feet increase in the prospective log harvest for western Oregon in the 1960's over the average 1959-60 cut is attributable entirely to increases in the projected allowable cut for public lands.

Table 28. — Relationship of the 1960 allowable cut to the 1959-60 actual cut on public lands

Area	1960 allowable cut ¹	Average 1959-60 annual log harvest	Difference from allowable cut	Difference in percent of allowable cut
	— Million board feet, Scribner log scale —			Percent
Puget Sound:				
Forest Service	725	660	-65	-9.0
Other public	418	178	-240	-57.4
Southwestern Washington:				
Forest Service	446	348	-98	-22.0
Other public	301	204	-97	-32.2
Northwestern Oregon:				
Forest Service	661	691	+30	+4.5
O&C and public domain	253	210	-43	-17.0
Other public	96	124	+28	+29.2
Southwestern Oregon:				
Forest Service	1,140	1,149	+9	+0.8
O&C and public domain	790	663	-127	-16.1
Other public	63	29	-34	-54.0
Douglas-fir subregion	4,894	4,256	-638	-13.0

¹ Includes nonchargeable cut.

² Fifty-four percent of the unused allowable cut occurred on non-Federal lands. The balance was distributed on lands administered by the Forest Service (19 percent) and Bureau of Land Management (27 percent).

Subregion's Prospective Log Harvest Nearly 1 Billion Feet Less Than Installed Capacity in 1960

As can be seen from table 27, the total installed capacity of plants in the Douglas-fir subregion in 1960 exceeded the prospective average log harvest in the decade of the 1960's by 0.9 billion board feet, log scale, or 7 percent of the 1960 capacity. This is appreciably lower than the average surplus of 14.8 percent during 1946-60 (table 23).

Subregion's Surplus Capacity Concentrated In Western Oregon

In 1960, the installed plant capacity in western Oregon was 8.4 billion feet, log scale, including 0.3 billion feet of logs for pulpwood purposes. The prospective log harvest for the 1960's is 7.3 billion board feet, log scale, about the same as in the 1950's, but 1.1 billion feet (13 percent) less than the installed capacity. Most of the excess, or 700 million feet, is in northwestern Oregon. The balance, 400 million feet, is in southwestern Oregon. The excess capacity in western Oregon is greater than that for the subregion due to a surplus of 200 million feet in the prospective log harvest for western Washington in the 1960's.

Pulp capacity is expected to expand, but it is believed unlikely that demand for pulp logs will have a serious impact on saw log or peeler log production. Recent trends suggest further reduction in lumber capacity and increasing plywood plant capacity.

Prospective Log Harvest in Western Washington Close to Present Capacity

In western Washington, the estimated installed capacity of the lumber, plywood, and pulp industries in 1960 was 4.6 billion board feet, log scale. This included 1.4 billion feet of logs for pulpwood, the average log consumption by the western Washington pulp industry from 1956 to 1960. The prospective log harvest for the 1960's is estimated at 4.8 billion board feet, log scale. This nearly equals the 1960 installed capacity. The situation is about the same for the Puget Sound and southwestern Washington subareas.

It is contemplated that the capacity of older sawmills originally designed for old-growth timber will decline further in western Washington. New sawmills better adapted to processing second-growth timber should eventually replace and in time expand existing lumber capacity. It is anticipated that plywood capacity in western Washington will remain relatively stable. Pulp capacity, it seems, will likely continue to expand.

Fedkiw, John.

1964. Forest industry capacity, production, and available log supplies in the Douglas-fir subregion. U. S. Forest Serv. Res. Paper PNW-11, 63 pp., illus.

Relations of capacity, production, and available log supplies are described in the lumber, plywood, and pulp industries of western Oregon and western Washington. Analysis is made of trends, outlook, and prospective problems of log supply and plant adjustment. Prospectively available log supplies are indicated by allowable-cut plans of public forestry agencies and by projections of available log supplies from private timberlands.

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